

THE EFFECTS OF SELF-DIRECTED AND TASK-ORIENTED COGNITIVE
STRATEGY USE FOR ACHIEVING RACQUETBALL SKILLS
IN BEGINNING AND ADVANCED PLAYERS

BY

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1994

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank those individuals who have made this dissertation possible. Sincerest thanks is extended to my committee members, Dr. Milledge Murphey and Dr. Harold Lerch, for their support and encouragement throughout the completion of this study. I am also deeply grateful to Dr. Robert N. Singer (chairman) and Dr. Ira Fischler (outside committee member) for all their guidance and suggestions which were provided to me since the commencement of this investigation.

I am especially grateful to Dr. L. Keith Tennant, my cochairman, for all the supervision he has provided me with for the past 8 years. Dr. Tennant has always been there for me to lend his support and guidance during my years in graduate school. Additionally, he has been a wonderful friend and mentor and has yielded much understanding and concern for me as a person. His patience and motivation paved the way for me to complete this project.

A special acknowledgement is extended to Dr. Sue Whiddon for her advice and support over the past year. Her understanding and encouragement gave me the strength to overcome the difficult times and the ability to achieve a Ph.D.

I would also like to express my thanks and gratitude to Mr. James McCachren, Mrs. Claudia Siders, Dr. Tennant, Dr. Fischler, Mr. David Porter, Ms. Karol Abendschein, and Dr. Scott Powers for all their help in the procurement of volunteers for this investigation. Without their assistance, this investigation could never have been realized.

Finally, I would like to express my deepest and sincerest gratitude to my mother, father, brother, and sister whose constant love and support provided me with the strength and courage to undertake and complete a doctoral dissertation.

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Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

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December, 1994

Chairman: Robert N. Singer

Major Department: Exercise and Sport Sciences

This experiment was designed to examine the question of whether beginning and advanced racquetball players would benefit more from a self-directed strategy, a task-oriented strategy, or a combination of the two strategies, when executing basic skills and during actual play.

Participants ($N = 80$) were assigned to either a self-directed, task-oriented, combined, or control group based on skill level (beginning versus advanced). During the initial meeting, they performed a total of 150 diagonal lob serves to the backside and frontside service courts and executed ten 30 s rallies. Subjects were verbally reminded to use their respective strategies and were requested to fill out strategy-use questionnaires following trial blocks 1, 3, 5, and 8 during both skill tests. Following the rallies, they repeated a total of 30 diagonal lob serves to the backside

and frontside and two additional 30 s rallies as retention measures. A final strategy-use scale was completed for both serves and rallies during the retention phases.

Approximately 1 week later, subjects returned to the courts to play a modified tournament against three other players with the same skill, but with each representing a different strategy group. They played a total of nine games and completed a final strategy-use scale for modified play. Control subjects completed an additional questionnaire regarding any possible strategy use.

Separate ANOVAs were used to analyze both skill tests, the total points scored and won/loss records for modified play, and the strategy-use scales. The results revealed that advanced players performed better than beginners for both the serves and rallies. Regarding the modified play, the task-oriented group won more games and points than the self-directed and control groups. Analysis of the strategy-use scales indicated that (1) the combined and self-directed groups consistently scored higher on serves than the control group, and (2) the combined and task-oriented groups scored higher than the self-directed and control groups in modified play. In general, task-oriented strategies appeared to be more useful than self-directed or combined strategies during actual play.

CHAPTER 1

INTRODUCTION

There has always been interest in developing new techniques or strategies for the purpose of maximizing achievement in sport situations. This has lead to a more formal analysis of what can work best, for whom, and under what conditions. Various strategies (sometimes referred to as learning or cognitive strategies) are being studied more rigorously in laboratory and field settings with the intent of contributing to more favorable instructional and learning procedures.

The term 'strategy' has been defined by several researchers (Gagné & Briggs, 1974; Rigney, 1978; Singer, 1980a; Snowman, 1986). Typically implied is that strategies are general plans for action to attain designated goals. Essentially, they are approaches to attaining task mastery that may be applied to many different learning situations whether the task is cognitive or motoric in nature. An individual must use his or her existing knowledge and perceptions in order to advance his or her level of task performance.

The strategy research literature has generally indicated consistent findings, that performance tends to

improve when relevant strategies are used appropriately. This is true for research in both the cognitive domain (Dansereau et al., 1979; Dansereau, Brooks, Holley, & Collins, 1983; Magliocca & Robinson, 1991; McCombs, 1982; Pressley, Johnson, Symons, McGoldrick, & Kurita, 1989; Weinstein, 1978) as well as the psychomotor domain (Johnston-O'Connor & Kirschenbaum, 1986; Ryan & Simons, 1982; Singer, DeFrancesco, & Randall, 1989; Singer, Flora, & Abourezk, 1989a, 1989b; Singer & Suwanthada, 1986; Weinberg, Seabourne, & Jackson, 1981; Zecker, 1982). Effective strategy use implies that the learner/performer is able to self-select a strategy or is provided with a strategy that can be applied effectively at the appropriate point in time depending upon level of skill and/or knowledge level.

Recently, Singer and Chen (1993, 1994) have addressed the issue of cognitive strategy classification and have proposed four specific classifications for strategy use in motor skills research and application. One of the categories has to do with self-initiated versus externally imposed strategies. In other words, strategies may be self-generated or provided by an outside source, such as a teacher or coach. A second category relates to task-specific versus task-general strategies. Task-specific strategies refer to those that may be used to attain skill when executing particular tasks. Task-general strategies are those that may be applied across a variety of related

tasks and situations. A third category involves learning or performance-based strategies. These strategies are used either primarily to contribute to the process of learning or to enhance performance of that which has been learned. Finally, self-directed versus task-oriented strategies represent the last category in the classification scheme. Self-directed strategies are primarily self-analysis and self-monitoring while task-oriented strategies are essentially dictated by the demands of the task.

The major premise described by Singer and Chen (1993, 1994) is that strategy research should be conducted using specific categories or classifications of strategies to better facilitate the understanding of experimental results. More specifically, the use of a strategy classification scheme should provide (1) guidelines for conducting research studies, (2) a framework for the interpretation of findings from these studies, and (3) procedures for strategy protocols to be standardized. Furthermore, these authors have stated that the use of a classification system should help to identify the best strategies to use depending upon the objective in a particular learning/performance situation. Singer and Chen's framework is a significant contribution to the strategy literature as it appears to be the first true attempt to categorize strategies relative to motor skills. However, there is a major shortcoming with their proposal that should be addressed.

The problem associated with using a classification system is that many strategies do not fit nicely into each of the four categories. For instance, when using the task-oriented or self-directed classification category, not all strategies may be thought of as clearly either task-oriented or self-directed. Using imagery as an example, a researcher may question how to classify it, since it may be used either way depending on one's interpretation. Imagery may be viewed as task-oriented because the learner/performer could image himself/herself performing the specific task, and the features to be attended to from an observer's viewpoint (i.e., externally). Yet, imagery may also be conceived as self-directed if it is used as a general preparatory technique (the process of imagery). Because not all researchers may agree on how to classify a particular strategy, research findings that are produced with similarly termed strategies may take on different interpretations.

Examined in this study is only one component of Singer and Chen's (1993, 1994) proposed classification system: task-oriented and self-directed strategies. The significance of this endeavor is that it is the first one in which an actual classification scheme has been associated with strategy use during a learning situation. Furthermore, the classification of strategies as task-oriented or self-directed were examined for their effectiveness on improving achievement in subjects with different skill levels.

Strategy Classification

A critical analysis of strategy research reveals that it is not always clear how a particular strategy is supposed to be used. What are the specific objectives and expectations in a particular study? This causes difficulty when attempting to classify strategies based upon primary function. Additionally, a great variety of strategies in many diverse situations have been studied for treatment effects. As a result, a classification of strategies as being primarily self-directed or task-oriented becomes an educated guess in many instances.

Nevertheless, self-directed strategies usually serve as a means of (1) self-evaluating (Kirschenbaum, 1984; McCombs, 1989; Singer, 1988; Singer & Cauraugh, 1985), (2) self-instruction (Kirschenbaum & Wittrock, 1984; Mace, Belfiore, & Shea, 1989; Meyers, Schleser & Okwumabua, 1982), (3) self-monitoring (Kirschenbaum & Bale, 1980, 1984; Kirschenbaum, Wittrock, Smith, & Monson, 1984), (4) relaxing (Noel, 1980; Singer, Cauraugh, Murphey, Chen, & Lidor, 1991; Weinberg, 1984), (5) readying for performance (Singer, 1988; Singer & Cauraugh, 1985), and (6) self-talk or self-efficacy statements (Mahoney, 1979, 1984; Weinberg, 1982, 1984; Weinberg, Smith, Jackson, & Gould, 1984). Self-directed strategies help learners to focus their attention internally to be prepared to learn or to perform. Furthermore, they are supportive of actual performers since they help maintain

an ideal internal state that enhances performance capabilities.

By comparison, task-oriented strategies are associated with specific tasks and situations, and include such strategies as (1) attentional focusing (Kirschenbaum & Wittrock, 1984; Mahoney, 1979, 1984; Singer, 1988; Weinberg, 1982, 1984), (2) refocusing (Singer, Cauraugh, Murphey, et al., 1991), (3) imagery or mental practice (Epstein, 1980; Feltz & Landers, 1983), and (4) anticipatory timing (Singer & Cauraugh, 1984) as well as other types of strategies such as (5) rhythmicity (Brown, Singer, Cauraugh, & Lucariello, 1985; Singer & Cauraugh, 1984). Task-oriented strategies are those strategies that are dictated by the demands of the task in which attentional focus is allocated appropriately to relevant cues and the task to be performed.

Superficially, these strategies seem to fit neatly into these classifications, but closer scrutiny reveals difficulties with attempts at categorizing. For instance, it could be argued that strategies such as self-evaluation, self-instruction, self-monitoring, readying, and positive self-talk may be classified as self-directed because each strategy serves as a means of monitoring performers attitudes, emotions, and motivational states relative to performance. Moreover, each of these strategies allow for internal adjustments to be made in the event that a performer experiences low motivation, self-doubt, or

anxiety. However, each of these strategies are used in reference to the task to be executed. In other words, performers (a) self-evaluate and self-monitor actual task performance, (b) administer self-instructions and positive self-talk relative to the task, and (c) ready or prepare themselves in ways similar to prior best performances. Therefore, it is apparent that when utilizing a self-directed strategy, the task plays a lesser role; however, it may not be completely disregarded.

Similar problems exist for task-oriented strategies. As previously stated, the classification of such strategies as attentional focusing, refocusing, and imagery into a task-oriented category will depend upon the researcher's interpretation of how these strategies are manipulated. Each may be categorized as self-directed or task-oriented depending upon how participants are instructed to use them during task performance. Furthermore, even when subjects are directed to employ such strategies in a task-oriented fashion, it could be questioned whether this may be done in the absence of self-reference.

Although an obvious problem exists with the self-directed and task-oriented classification scheme, it still provides the researcher with a viable framework for the explanation of findings. Primarily, investigators must make their strategies as completely self-directed or task-oriented as possible so that research results may be

interpreted as accurately as possible.

An objective of this study was to examine the self-directed and task-oriented strategy classification category and how each type affected performers with different levels of skill. If deliberately activating a self-directed strategy or a task-oriented strategy, would successful outcomes depend upon the skill level of the learner/performer? For example, there appears to be a conflict in the literature as to whether beginning or advanced performers will benefit equally when using similar types of strategies. Much of the research on advanced performers has indicated that a combination of both self-directed and task-oriented strategies is best for enhancing performance. Yet, research on beginning performers has yielded evidence which is ambiguous about whether a self-directed approach, a task-oriented approach, or a combination of the two approaches is more beneficial for performance improvement.

Skill Level

Pairing appropriate strategy styles with skill level seems to be a viable way to effectively influence performance. Fitts and Posner (1967) have suggested three stages of learning which learners appear to transcend as they practice and acquire a motor skill. Only two of these stages, the early and later stages, are relevant to the proposed experiment. Beginners (early stage) are characteristically more concerned with 'what to do',

experience inconsistent performances, and rely on instructions to determine the best way to perform a task. In comparison, advanced performers (later stage) are characterized by consistent movements, pay less attention to their actions, and are able to process information from other aspects of the task. Since beginners are concerned with 'what to do', it could be implied that strategies that allow attention to be focused externally to the task may be more appropriate for them since task-relevant cues seem to be most important. Likewise, if advanced performers tend to experience less conscious (cognitive) involvement and are able to attend to other aspects of their performance (i.e., problem solving), then perhaps self-directed strategies are more appropriate as they allow the self-analysis of performance.

These implications for strategy use and skill level seem logical; however, the data do not necessarily support these presumptions. With advanced performers, research has indicated that a combination of both self-directed and task-oriented strategies is beneficial for performance enhancement (De Witt, 1980; Fenker & Lambiotte, 1987; Weinberg et al., 1981; Wrisberg & Anshel, 1989). However, the results of investigations with beginning performers have been less clear. Some studies have indicated that a combination of self-directed and task-oriented strategies can improve performance (Gray, 1990; Singer & Suwanthada,

1986) while other experiments have yielded results implying that such strategy combinations do not enhance performance (Meyers, Schleser, Cooke, & Cu villier, 1979; Noel, 1980; Weinberg, Gould, Jackson, & Barnes, 1980). Furthermore, there are investigators who have advocated a more task-oriented approach for beginners (Martin & Lumsden, 1987) while others have supported a more self-directed approach (Johnston-O'Connor & Kirschenbaum, 1986; Kirschenbaum, Ordman, Tomarken, & Holtzbauer, 1982).

Theoretical Bases

A theoretical framework is necessary to interpret the potential interaction of different strategies with various levels of skill. The foundation for this study lay with three conceptual orientations: (1) self-efficacy theory (Bandura, 1977), (2) theoretical models of self-regulation (Crews, 1993; Kirschenbaum, 1987), and (3) selective attention models (see Abernethy, 1993). These three frameworks were relevant for the purposes of this study because of the strategies that were used as treatments. Self-monitoring was based in part upon Bandura's self-efficacy theory as well as various theoretical models of self-regulation. Likewise, attentional focusing was founded in selective attention theory. These three different theoretical orientations were essential for the explanation and discussion of the strategies that were studied in this investigation.

According to Bandura (1977), self-efficacy theory is founded on the supposition that various psychological methods serve to produce and strengthen self-efficacy expectations. Bandura has proceeded to state that

expectations of personal mastery affect both initiation and persistence of coping behavior. The strength of people's convictions in their own effectiveness is likely to affect whether they will even try to cope with given situations . . . Not only can perceived self-efficacy have directive influence on choice of activities and settings, but, through expectations of eventual success, it can affect coping efforts once they are initiated. Efficacy expectations determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences. The stronger the perceived self-efficacy, the more active the efforts. (pp. 193-194)

The use of self-monitoring would serve to enhance self-efficacy in individuals at all levels of skill when attending to the positive aspects of performance (i.e., achievements) and perhaps when attending to performance error with positive attitudes (i.e., constructive negative self-monitoring).

If a person is aware of those aspects of a task he or she is performing correctly, then self-efficacy is likely to improve due to feelings of self-accomplishment. Likewise, merely attending to one's failures increases the probability that performance will be lowered. Bandura (1991) has acknowledged that "Self-regulatory processes produce emotional effects that can undermine performance

motivation..." (p. 273). Thus, if learners and performers self-monitor their mistakes in a constructive and positive manner then performance improvements are apt to be observed. Self-efficacy levels should be elevated as a result of constructive self-monitoring. As learners and performers expect greater personal efficacy, performance tends to be facilitated in the task to be mastered. In other words, if a person believes that he or she has the ability to successfully execute a skill, then the probability of doing so is greater.

Furthermore, the effective activation of self-monitoring techniques is associated with different self-regulation models. Crews (1993) has defined self-regulation as automatic functioning in the absence of external controls. Kirschenbaum (1985, 1987) has proposed a five-stage model of self-regulation: (1) identifying the self-regulation problem, (2) committing to changing the problem, (3) executing through self-monitoring and self-evaluation techniques, (4) managing the environment, and (5) generalizing self-regulatory behavior change. Self-regulation is based in part on cybernetic theory which attempts to describe how closed-loop systems self-regulate via negative feedback loops (Crews, 1993; Robb, 1972). Basically, the output of a system modifies the input through the detection of errors until a correct response is executed.

Applying these ideas to sport performance, self-monitoring then becomes a self-regulation method which allows learners/performers to monitor successful task performance. As a process, the act of self-monitoring serves to increase the likelihood of making a correct response. Self-monitoring has been shown in several investigations to facilitate the learning and performance of motor skills (Johnston-O'Connor & Kirschenbaum, 1986; McKenzie & Rushall, 1974) and has been advocated by many investigators as a viable performance enhancement technique (Chen & Singer, 1992; McCombs, 1988, 1989).

Relative to the strategy of attentional focusing, Abernethy (1993) has discussed different theories and models of selective attention (i.e., filter models, attenuation model, and pertinence-based models of selective attention). Selective attention is the ability to focus on relevant cues while disregarding or ignoring irrelevant information in the environment (i.e., distractors). According to Abernethy, there are three major factors in sport situations that may influence how effective the "selective attention process will be: (1) the total amount of information in a display, (2) the time required to pick up and process the essential information, and (3) the ability of the player" (p. 156). This would seem to indicate that higher skilled individuals will be more effective than lesser skilled performers in terms of selectively attending to relevant information in

the environment.

Attentional focusing has been shown to enhance performance in motor learning experiments (Singer, Cauraugh, Murphey, et al., 1991; Singer, Lidor, & Cauraugh, 1993; Singer, Lidor, & Cauraugh, 1994). As individuals learn to selectively attend to relevant cues in the environment, they ignore irrelevant information leading to improved task performance. To emphasize the importance of the ability to attentionally focus on the appropriate cues relevant to performance, Nideffer (1993) has stated that "...performance potential is strongly related to an athlete's ability to direct attentional processes effectively..." (p. 553).

Each of these conceptual orientations may play an individual role in explaining how these self-directed and task-oriented strategies impact upon the performance of beginning and advanced racquetball players. The findings of this investigation should provide information as to whether self-monitoring (self-directed strategy), attentional focusing (task-oriented strategy), or both strategies merged together are beneficial for players executing basic racquetball skill tests and actual play. Furthermore, information resulting from the use of Singer and Chen's (1993, 1994) classification system may help indicate the most beneficial strategy type for teaching beginning and advanced players. Results will be interpreted within both Singer and Chen's proposed classification scheme and

appropriate theoretical models.

Statement of the Problem

The purpose of this study was to determine whether a self-directed (self-monitoring) strategy, a task-oriented (attentional focusing) strategy, or a combination of both strategies was more effective in enhancing learning/performance for beginning as compared with advanced racquetball players.

The independent variable in this study was the type of strategy administered to the racquetball players. More specifically, four types of conditions were compared: (1) self-monitoring (i.e., self-directed strategy), (2) attentional focusing (i.e., task-oriented strategy), (3) a composite of these strategies, and (4) no strategy. Categorical variables consisted of skill level (beginning versus advanced players). The dependent variables included: (1) two separate skill test scores, (2) the total points scored in a modified play situation, (3) won/loss records for players in the modified play situation, and (4) scores for the strategy-use scales.

Research Hypotheses

The research hypotheses that were examined in this study are as follows:

1. A combination of self-directed and task-oriented strategies would enhance learning and performance for beginning racquetball players more effectively than either a

task-oriented strategy, a self-directed strategy, or a no-strategy condition. Although the literature surrounding the use of combined strategies is equivocal for beginning level players, perhaps the combined use of a self-directed strategy (self-monitoring) and a task-oriented strategy (attentional focusing) would lead to better results than if either approach was used individually.

This expectation was based upon research that has successfully used self-monitoring to: (a) improve performance in classroom situations involving normal and learning disabled children (De Haas-Warner, 1991; Delclos & Harrington, 1991; Maag, Rutherford, & DiGangi, 1992; Malone & Mastropieri, 1992; Prater, Hogan, & Miller, 1992; Prater, Joy, Chilman, Temple, & Miller, 1991; Sawyer, Graham, & Harris, 1992), (b) enhance various sport techniques (Bell & Patterson, 1978; Johnston-O'Connor & Kirschenbaum, 1986; Kirschenbaum et al., 1982), and (c) increase exercise regulation and adherence (Dunbar et al., 1992; King, Taylor, Haskell, & DeBusk, 1988; Noland, 1989; Weber & Wertheim, 1989). The research has indicated that self-monitoring is a technique that may be successfully used by a variety of people in many different situations to improve performance levels. This hypothesis was also based upon various investigations which have yielded evidence that attentional focusing improves performance on novel motor tasks (Singer, DeFrancesco, & Randall, 1989; Singer et al., 1989a, 1989b;

Singer, Cauraugh, Murphey, et al., 1991; Singer et al., 1993; Singer & Suwanthada, 1986) and athletic skills (Weigand, Weinberg, Jackson, Hanks, & Litke, 1992).

Furthermore, a combination of self-monitoring and attentional focusing should result in superior performances for beginning racquetball players based on the conceptual ideas that (a) self-monitoring one's performance (both successes and failures) in a constructive manner should result in a greater sense of self-efficacy, thus leading to better overall performances, (b) self-monitoring is a process that allows individuals to self-regulate and correct performance error via feedback, (c) self-monitoring should assist in the process of setting and achieving higher goals, and (d) selectively attending to relevant, meaningful cues of the task should enable performers to disregard self-induced or environmental distractors. The beginning players used in this investigation had sufficient knowledge and experience in racquetball that allowed them the ability to focus their attention appropriately and successfully self-monitor their performance.

2. A task-oriented strategy would facilitate greater achievement in beginning racquetball players than either a self-directed strategy or a no-strategy condition. Based upon the work of Fitts and Posner (1967), beginners should perform at a higher level using task-oriented strategies rather than self-directed strategies as they are usually

most concerned with the best way to perform the task (i.e., what to do). Along a similar line of thinking, Ferrari, Pinard, Reid, and Bouffard-Bouchard (1991) have indicated that self-regulation of performance (i.e., self-directed approach) is fairly limited for beginners because of a deficient knowledge base relative to performance. Likewise, a number of scholars have supported a task-oriented approach over a self-directed approach for beginners (Martin & Lumsden, 1987; Schmidt, 1988).

With respect to Fitts and Posners' (1967) cognitive stage of learning, it was predicted that attentional focusing would be more advantageous for beginning racquetball players due to the fact that beginners execute more errors (i.e., mistakes), experience inconsistent performances, and need more instruction time to assist in task execution. Since beginners are concerned primarily with 'what to do', attentional focusing may be the preferred strategy as it allows performers to allocate their attention to the demands of the task. Based upon Fitts and Posners' three stages of learning, it could be conjectured that a task-oriented strategy may be of greater use for beginners because their primary concern is with the task rather than with the self. Weinberg, Gould, and Jackson (1980) have determined that attentional focusing was used by beginning subjects more frequently when compared with other strategy use.

3. A self-directed strategy would promote better proficiency in beginning racquetball players as compared with a no-strategy condition. This hypothesis was based upon the work of Kirschenbaum whose results indicated that positive self-monitoring techniques improved performance for unskilled bowlers and golfers (Johnston-O'Connor & Kirschenbaum, 1986; Kirschenbaum et al., 1982) as well as evidence (Ryan & Simons, 1982; Singer et al., 1989a, 1989b; Singer & Suwanthada, 1986) which has suggested that using any type of relevant strategy is superior to no strategy at all.

Because the players in this study had sufficient experience and adequate knowledge with the sport of racquetball, it was predicted that they would be able to successfully employ self-monitoring as a performance enhancing technique. Players should be able to self-observe and self-record their performances as well as perceive and correct for error. As Bell and Patterson (1978) have stated, "It is likely that when an individual begins attending closely to one aspect of his/her behavior, that behavior will change, whether or not change is intended" (p. 103). Basically, self-monitoring may be used as a behavior modification technique. Furthermore, self-monitoring in a constructive way should result in greater skill achievement due to higher self-efficacy and motivation levels and should contribute to the goal-setting process.

4. A combination of self-directed and task-oriented strategies would contribute to greater skill in advanced racquetball players than either a self-directed strategy, a task-oriented strategy, or a no-strategy condition. This hypothesis was based upon many studies in which a combination of self-directed and task-oriented strategies has resulted in improved performance in skilled athletes (De Witt, 1980; Fenker & Lambiotte, 1987; Gal-Or, Tenenbaum, & Shimrony, 1986; Houghton, 1991; Hume, Martin, Gonzalez, Cracklen, & Genthon, 1985; Mace, Eastman, & Carroll, 1986, 1987; Meyers, Cooke, Cullen, & Liles, 1979; Meyers & Schleser, 1980; Noel, 1980; Rushall, Hall, Roux, Sasseville, & Rushall, 1988) and was superior to either a self-directed or task-oriented approach (Weinberg et al., 1981; Wrisberg & Anshel, 1989).

This prediction was also based upon self-efficacy theory, models of self-regulation, and selective attention theory. The advanced racquetball players utilized in this study were at a higher level of skill relative to the beginning players; however, they were not so advanced that self-monitoring and attentional focusing would not be beneficial. As with the beginning level players, self-monitoring should: (a) increase levels of self-efficacy if used in a constructive manner, (b) serve as a process for self-regulation via error feedback, and (c) benefit the setting and acquisition of goals.

Moreover, attentional focusing should serve to elevate skill level by (a) reducing the effect of mental and environmental distractions during performance, and (b) allowing players to attend to meaningful cues during play. Findings from studies conducted by Abernethy (1988, 1990) have indicated that experts as compared to novices are more proficient in attending to meaningful cues in the environment and are able to efficiently problem-solve and execute quicker decisions.

5. A self-directed strategy would lead to higher levels of skill in advanced racquetball players as compared with a task-oriented strategy or a no-strategy condition. This expectation was based upon the work of Fitts and Posner (1967) who have stated that at more advanced levels of learning, performers rely less on their cognitions in terms of 'what to do' during performance and are able to engage in decision-making and problem-solving activities relative to other aspects of their performance. The implication is that a self-directed approach (strategies of self-analysis) may be more useful than a task-oriented approach (strategies based on the demands of the task).

Essentially, it was predicted that advanced players would be able to make better use of self-monitoring than attentional focusing because there is less concern with the task itself (i.e., what to do). Performers at this stage are able to recognize errors and make corrections with less

cognitive involvement. Therefore, self-monitoring (self-observing and self-recording one's own performance) should be more beneficial at this stage than attentional focusing (based upon the demands of the task) in terms of furthering skill level. Ferrari et al. (1991) have related that self-regulation (i.e., self-directed approach) is more beneficial for advanced performers as compared with beginners due to greater knowledge developed from previous performances.

6. A task-oriented strategy would enhance the achievement of advanced racquetball players as compared with a no-strategy condition. This hypothesis was founded on research by Abernethy (1988, 1990) and Abernethy and Russell (1987) which have revealed that higher skilled individuals are better able to anticipate and attend to relevant information from the environment. This conjecture was also based on research in which experimental groups receiving a relevant strategy of some type perform better than no-strategy (control) groups (Johnston-O'Connor & Kirschenbaum, 1986; Singer, DeFrancesco, & Randall, 1989). Furthermore, since the players used in this experiment were not considered to be 'elite' (i.e., performance was not autonomous), a certain amount of focus on the task should be necessary for performance improvements to occur. In other words, there should still be a certain degree of concern for the task itself although the task plays a lesser important role for advanced players as compared with beginners.

Operational Definitions

Terms defined for the intent of this investigation were as follows:

Advanced Skilled racquetball players consist of those players at the A and B levels (see definitions for Level of Play).

Beginning Skilled racquetball players consist of those players at the C and D levels (see definitions for Level of Play).

Diagonal Lob Serve is a serve that hits high on the front wall (above 2.44 m), travels in a high arc, and lands with a high bounce in the opposite back corner of the court.

Focusing is a task-oriented strategy in which a learner concentrates on a single aspect of the task to avoid thought, visual and/or auditory distractions (Singer & Cauraugh, 1985).

Games in actual racquetball situations consist of 15 points. However, for the purposes of this study, a single game consists of 6 points.

Level of Play (A) consists of advanced level racquetball players with open level defined as advanced A players (Turner & Hogan, 1988).

Level of Play (B) consists of intermediate level racquetball players (Kittleson, 1992).

Level of Play (C) consists of advanced beginner racquetball players (Kittleson, 1992).

Level of Play (D) consists of intermediate beginner racquetball players with novice level defined as true beginning players.

Matches in racquetball consist of the best two out of three games. For the purposes of this study, a match consists of three games to 6 points, regardless of whether a subject wins the first two games.

Modified Play consists of three matches of three games each. Each player will play three games of 6 points with three other players of a similar skill level and who have received a different strategy treatment.

Rally Skill Test is an assessment test used to determine a player's ability to keep the ball in play (Isaacs, Lumpkin, & Schroer, 1984).

Retention test is a test which assesses the amount of forgetting (performance loss) after a period of time following the original learning (Schmidt, 1988).

Self-Directed Strategy is one in which learners/performers direct their attentional focus within themselves (i.e. internally) without regard for the task. Essentially, these are strategies of self-analysis (Singer & Chen, 1993, 1994).

Self-Monitoring, according to Nelson (1977), is a self-regulation technique involving both the self-observation and self-recording of behavior (cited in Mace et al., 1989, p. 30). Essentially, self-monitoring involves an awareness of

correct movements as well as mistakes and how to correct for performance error.

Task-Oriented Strategy is one in which learners/performers direct their attentional focus externally to the task. Basically, these are strategies that are dictated by the demands of the task (Singer & Chen, 1993, 1994).

Transfer is the loss or gain in a performer's ability to execute one task as a result of practice on another task (Schmidt, 1988).

Basic Assumptions

The following assumptions were made when conducting this study:

1. Experimental groups used their appropriate strategy treatments throughout the study. The reason for this assumption was that all groups receiving treatments were periodically reminded to use their strategies during task performance and were administered strategy-use scales to complete.

2. Control groups activated a strategy of some type for performance enhancement, yet these strategies were not as effective as the ones administered to experimental groups. When performing motor or cognitive tasks, individuals generally derive a strategy(s) for purposes of achievement.

3. The strategies used in this experiment were correctly classified as self-directed and task-oriented.

Strategy protocols were designed so that correct classification was evident.

4. The strategy treatments administered to each experimental group were sufficiently strong enough to elicit a treatment effect. This assumption was due to the presence of strategy reminders and strategy-use scales.

5. Experimental groups receiving combinatorial self-directed and task-oriented strategies (self-monitoring, attentional focusing) used each substrategy. Again, this assumption was due to the presence of strategy reminders and strategy-use scales.

6. Any performance improvements by experimental groups would be due to the treatments and not experimenter bias. Interactions between participants and the experimenter were limited to the administration of strategy treatments, strategy reminders, and strategy-use scales. All participants were treated equally within groups.

7. Players were correctly classified according to their level of skill. Skill level classifications were based on three factors: (a) the number of years they have been playing racquetball, (b) their level of play, and (c) the attained scores on the rally screening check.

8. The strategies used in this investigation were meaningful for the different skilled players. This assumption was based on the fact that beginning racquetball players have adequate knowledge and experience with the

sport so that the strategies would be considered useful. Similarly, advanced performers were not at an elite level of performance. Therefore, the strategies would be beneficial as learning should still occur. Additionally, most players engage in four-wall racquetball. Because this investigation entailed three-wall racquetball, each of the racquetball tasks that were performed may be considered novel.

Limitations

Limitations for this study were perceived to be as follows:

1. Participants may not have used their respective strategy treatments effectively while being tested. This could be due to the possibility that they may have disregarded or forgot their designated strategies. To increase probabilities of strategy use, each participant was verbally reminded to use the strategy on a regular basis throughout each trial block for the diagonal lob serve skill test. They were verbally reminded to use their strategies prior to each trial block of the rally skill test and prior to the start of the modified play situation. Furthermore, they completed a strategy-use scale following the conclusion of the first, third, fifth, and eighth trial blocks for each of the two skill tests. The purpose of the strategy-use scale was not only to guarantee the use of the strategy treatment, but also to ensure that the strategies were being used properly.

2. Participants in control groups may have developed preferred strategies to enhance learning and performance, although these strategies might not have been as effective as the strategies provided to the experimental groups. To reduce the impact of this limitation, control subjects were (a) not aware of the strategies taught to experimental groups, and (b) questioned at the end of the study as to whether some type of strategy was used while participating in the study.

3. The classifying of strategies as strictly self-directed or task-oriented has some inherent weaknesses. To account for this, the protocols used for the strategies were clearly self-directed (self-monitoring) or task-oriented (attentional focus towards the task) to eliminate potential questions regarding their unique classification.

4. The imposed strategy treatments may not have been administered strongly enough to elicit a positive effect, if indeed they should have, within and between the respective experimental and control groups. To ensure that treatments were more effective, participants in the experimental groups (a) listened to a tape in an isolated testing room that explained the appropriate strategy treatment, (b) read a typed version of the strategy treatment tape while listening to the tape, (c) were quizzed at the end of these instructions to make sure that the strategy was understood, (d) were allowed to practice using their respective

strategies prior to the execution of each racquetball skill test, (e) were periodically reminded to use their respective strategies during the diagonal lob serve skill test, (f) were reminded to use their strategies prior to each trial block of the rally skill test, (g) were reminded to use their strategies prior to the modified play situation, and (h) were instructed to fill out a strategy-use scale at the conclusion of the first, third, fifth, and eighth trial blocks of the diagonal lob serve skill test and rally skill test which indicated whether the strategies were being used.

5. The presence of unfavorable weather conditions created problems for testing on certain days. Because this study was conducted outdoors at the three-wall racquetball courts, a major limitation was the probability of rain. This occurrence resulted in increased time needed between the administration of the skill tests, retention tests, and the modified play situation for certain players. To reduce this potential problem, testing times were standardized during the morning hours when possible.

6. Traditional small-faced racquets or defective racquets could potentially place players at a performance disadvantage when executing racquetball skills. Certain subjects wished to play with racquets that did not meet the specifications of the study. Racquets were screened (see procedures) to ensure that mid-sized and over-sized racquets were employed throughout the investigation. The

investigator had additional racquets available in the event that a racquet was to be substituted.

7. Strategy treatments may have weakened from the point in time they were administered to the moment they were actually used. There was approximately a 10 min period of lag time between strategy treatment administration and arrival at the racquetball courts which may have resulted in a diminished effect of the strategy treatments. To minimize this problem, the strategy treatments received by experimental groups were as strong as possible. Furthermore, the experimental groups had practice trials using their strategies prior to each skill test.

8. Control and experimental groups could be unbalanced with respect to treatment time. To ensure that control groups received equal exposure time to the researcher prior to testing, they were provided with general information about racquetball. This information was approximately the same length of time as the strategy treatments administered to the experimental groups.

Significance of the Study

It is still unclear, based upon research findings as well as popular teaching methods, which type of strategy (self-directed or task-oriented) is most effective and therefore preferred for early and later learning. Furthermore, the possibility exists that both a self-directed and task-oriented approach may be equally important

in early and later learning, and better than experiencing each one separately at different points in learning. This is the first investigation that attempts to provide a data base about how strategies interact with skill level, when using a classification system for strategies.

This study is significant for at least three reasons. First, the primary benefactors of this investigation will be instructors, teachers, coaches, and trainers involved in the teaching of movement skills. The results may dictate whether a strategy representing a particular category is appropriate to administer to beginning and advanced learners. It should become more readily apparent whether a self-directed approach, a task-oriented approach, or a combination of both approaches is more advantageous for sport skills instruction for beginning and advanced performers.

Second, the data should contribute to the body of knowledge and, therefore, influence subsequent research as the design of this study represents a first attempt to test the classification scheme proposed by Singer and Chen (1993, 1994). The results will either support or refute the contention that strategies should be classified as task-oriented or self-directed. If the findings are supportive for such a classification system, then future investigators may desire to classify strategies as task-oriented or self-directed if appropriate for their research. Using this

particular classification system may help provide a framework that facilitates the explanation of results, leading to a clarification of learning strategy research. It may also influence future endeavors in this area. Furthermore, this study, along with future investigations, could provide standardized procedures for strategy protocols.

Finally, findings are equivocal relative to the most appropriate strategy to use when considering level of skill. This is especially true for beginners. Researchers have various opinions as to whether task-oriented (Martin & Lumsden, 1987) or self-directed (Johnston-O'Connor & Kirschenbaum, 1986; Kirschenbaum et al., 1982) approaches are more appropriate for beginning performers. Many studies (Singer et al., 1989a; Singer & Suwanthada, 1986) have yielded evidence that beginning performers improve when they activate task-oriented and self-directed strategies. However, in some cases, performance has failed to improve (Weinberg, Gould, & Jackson, 1980; Weinberg, Gould, Jackson, & Barnes, 1980) or has tended to deteriorate (Noel, 1980) for beginners with strategy use. Such results could be attributed to problems in methodology and weak strategy treatments.

With respect to advanced performers, researchers (Houghton, 1991; Weinberg et al., 1981; Wrisberg & Anshel, 1989) have shown that various combinations of self-directed

and task-oriented strategies are beneficial for performance enhancement. Yet, very few studies have apparently been conducted that have examined the effects of self-directed or task-oriented strategies on a separate basis. This study should provide a basis to resolve such conflicts and the findings of this study may potentially resolve the primary issue as to whether self-directed strategies, task-oriented strategies, or both strategy types combined are more appropriate for beginning and advanced performers.

CHAPTER 2

REVIEW OF LITERATURE

In order to provide a comprehensive overview and to better understand the relevant research literature, this chapter is divided into the following sections. The various definitions and characteristics of strategies will be described in Section 1. The second section will include a discussion of the self-directed and task-oriented classification system. Topics that are addressed include the rationale for the self-directed and task-oriented classification system, classifying the strategies used in this study as either self-directed or task-oriented, and the inherent problems associated with such a classification system.

Presented in the third section will be the various theoretical frameworks associated with this type of research, including self-efficacy theory, self-regulation models, selective attention theory, as well as Fitts and Posners' (1967) concept of three stages of learning. Skill level is examined in the fourth section, and strategy research that has been conducted with advanced and beginning performers is reviewed. In the final section, a brief discussion is devoted to the use of strategies relative to

the type of task to be performed (self-paced versus externally-paced motor tasks, short/rapid versus extended/slow events).

Strategies

Definitions and Characteristics

Prior to a discussion of the self-directed and task-oriented classification system as well as research involving the use of strategies for learning and performance, it is appropriate to define the term 'strategy' and to discuss the ideal characteristics of strategies.

Many definitions for the term 'strategy' have been proposed in the literature by various researchers (Gagné, 1974; Gagné & Briggs, 1974; Rigney, 1978; Weinstein & Mayer, 1986). For instance, Singer (1980a) has indicated a strategy to be "a self-initiated or externally imposed way of directing information leading to decisions for purposeful behavior" (p. 593). Logan and Zbrodoff (1982) have interpreted a strategy to be the optimal structuring of cognitive processes intended to successfully realize goals in specific achievement circumstances. Snowman (1986) has stated that a strategy is a general scheme which assists in the acquisition of a single or several instructional goals.

These are merely samples of the many definitions for the term 'strategy' that have been suggested by researchers in motor behavior and education. A common thread in each interpretation is the idea that a strategy is an internal

plan which governs how new knowledge is processed, how decisions are made, and ultimately how goals are achieved. Moreover, strategies are characterized by a variety of qualities that may make certain strategies more desirable than others.

Ideal strategies are those strategies that are compatible with the knowledge level, skill level, and cognitive style of the learner (Singer, 1984). The learner must not only understand how to use the strategy, but also to recognize the best time to execute the strategy of choice depending upon the task to be performed. According to Singer (1984), "effective learning strategies should improve the way [cognitive] processes work" (p. 271). Ideally, strategies should be global (i.e., applied across several different learning situations) as opposed to task-specific. Task-specific strategies are restricted to the performance enhancement of specific tasks and are limited in their utility because there is virtually little or no transfer among tasks when using these types of strategies. In comparison, more general or global strategies may be utilized for improving performance in a wide variety of motor tasks. A prime example of a global strategy is the Singer Five-Step Strategy (Singer & Cauraugh, 1985).

Furthermore, strategies that are self-generated are more desirable as opposed to strategies that are provided by outside sources (e.g., a teacher or coach). As Singer and

Cauraugh (1985) have stated, strategies that are imposed by external sources may serve to improve performance initially. However, in the absence of a coach or instructor in a future related situation, the learner may not be able to effectively use the strategy. Therefore, rather than relying upon a teacher or coach, the learner may benefit to a greater extent if he/she is able to self-initiate an appropriate strategy.

Performance may be enhanced with the appropriate use of suitable strategies as required by the demands of the task. Individuals who will primarily benefit are those who are able to (a) self-generate strategies, (b) discern the most appropriate strategies to execute depending upon the task, (c) recognize the best time to execute a strategy, and (d) make use of general strategies. Individuals with the capability to problem-solve, adapt, and use strategies in anticipated or unanticipated circumstances will experience a performance advantage in both training and competitive situations (Singer, 1984).

A Self-Directed and Task-Oriented Classification System

Rationale for a Classification System

Instructors, teachers, coaches, athletes, and sport psychologists are generally concerned with determining the best learner techniques that can/should be used to facilitate achievement in mastering movement skills. As previously stated, general learning strategy research has

consistently demonstrated that the use of some type of relevant strategy generally improves task performance compared to no strategy conditions. However, answers to more specific research questions surrounding skill level or the type of task may be more readily obtained using some type of classification system.

Singer and Chen (1993, 1994) have proposed and defined four classifications for cognitive strategies including: (1) task-specific versus task-general strategies, (2) self-initiated versus externally-imposed strategies, (3) strategies for learning versus performance, and (4) strategies that are self-directed versus task-oriented. Each of these classifications provide a unique method for the conduction of research and for more precise interpretations of research findings.

Singer and Chen (1993, 1994) have stated that the major purposes for categorizing strategies into some type of classification scheme is to (a) provide a guideline for strategy use when formulating strategy research, (b) standardize strategy procedures, and (c) provide a framework for the interpretation and understanding of results. An appropriate analysis of research findings would be based foremost upon the establishment of standard strategy protocols when conducting research. Researchers must standardize objectives and expectations as to how strategies are used and then compare the results of studies according

to similar objectives and use of strategies.

Classifying strategies into categories such as self-initiated or externally-imposed, self-directed or task-oriented, task-specific or task-general, or learning versus performance should allow research findings to be consistently explained with respect to specific research questions. For example, research using a self-directed or task-oriented classification system may provide further information as to which type of strategy is best depending upon level of skill (e.g., beginners versus higher skilled) or type of task (e.g., open versus closed motor skills). Information of this type is important for all types of learners and instructors concerned with motor skills.

Moreover, classification systems like the self-directed and task-oriented scheme should also be applicable to the classroom. Indicated may be that certain strategies are more appropriate depending upon a student's skill level and knowledge base (i.e., early versus later learning). McCombs (1989) has indicated that research is needed to determine which kinds of strategies are more beneficial for learning depending upon both the age and developmental stage of students. Furthermore, McCombs has stated that appropriate strategy use may depend upon the classroom practices of teachers. Self-directed strategies such as self-monitoring and self-evaluation are thought to be more appropriate when the emphasis is upon learning (i.e., assisting students in

understanding the self, personal goals, and their abilities) versus performance or competition.

Classifying Strategies

The previous section addressed the major reasons, provided by Singer and Chen (1993, 1994), as to why strategies should be classified into various categories. In general, it was suggested that a classification system of strategies would provide a means for identifying the most appropriate strategies to implement depending upon the objectives, circumstances, or requirements for achieving. Furthermore, categorizing strategies into various classifications may allow research findings to be more readily explained as well as more easily put into effect in instructional programs.

The primary focus of the research in this investigation centered around the use of strategies that may be categorized as either self-directed or task-oriented. A self-directed strategy is one in which learners direct their attentional focus within themselves (i.e., internally) without regard for the task. Essentially, these are strategies of self-analysis. This experiment involved the use of self-monitoring which is considered to be a self-directed strategy as it deals directly with the learner/performer (i.e., self) rather than the task. By directing the focus internally or to the 'self', the learner/performer is able to use a strategy for performance enhancement while,

for the most part, disregarding the task.

Self-monitoring involves focusing on both the positive and negative aspects of performance. In other words, learners and performers attend to both their successes and mistakes. Self-monitoring is a method by which individuals can self-regulate their performance or behavior via self-observation and self-recording and serves as a process for increasing one's self-awareness for necessary behavior modification. Mace et al. (1989) have termed behavioral changes due to self-observation and self-recording as the 'reactivity of self-monitoring'. According to Bandura (1991), self-observation "provides the information needed for setting realistic goals and for evaluating one's progress toward them" (p. 250). Self-monitoring has been studied largely in the field of education and has been shown to advance performance with children in classroom settings (Maag et al., 1992; Malone & Mastropieri, 1992; Prater et al., 1992). McCombs (1989) has referred to self-monitoring, self-evaluation, and self-awareness as self-system processes that contribute to goals of self-development and self-determination and afford the foundation for the development of self-regulated learning.

In discussing self-monitoring, Bandura (1991) has related that attending to one's successes can have a motivational effect while on the contrary focusing on mistakes and failures may weaken performance. In a series

of articles, Kirschenbaum (1984, 1985, 1987) has indicated self-monitoring as either positive self-monitoring or negative self-monitoring in which individuals attend to either their successes or failures, respectively.

Kirschenbaum (1984) has stated that the use of positive self-monitoring is more beneficial when the task to be executed is novel or difficult (early learning). On the other hand, when a task is routine or over-learned, negative self-monitoring may be more advantageous for performance improvements to occur (later learning).

However, several questions may be raised concerning the use of either positive self-monitoring or negative self-monitoring as single entities. If one engages in positive self-monitoring by itself, how does self-regulation play a role in terms of raising levels of performance?

Essentially, how can performance improve if we ignore our mistakes? Can the learning process be expected to be furthered when failures are disregarded? Furthermore, can failure be truly ignored when it occurs? Is there not a certain degree of self-awareness when errors are executed? Additional questions may be raised with regard to negative self-monitoring. Can performance of any task actually improve if the entire emphasis is on failure? It would seem likely that if the primary focus was directed away from achievement and toward failure that in the long run performance gains would be minimal and self-efficacy would

be reduced.

In this investigation, it is argued that both positive self-monitoring and negative self-monitoring together are vital for learning to occur and they should not be used separately. Both successes and failures play a vital role in the learning process. As stated above, Kirschenbaum (1984) has suggested that positive self-monitoring and negative self-monitoring are beneficial depending upon the stage of the learning process. However, the issue may be raised that negative self-monitoring is influential in both the early and later stages of learning depending upon how it is applied. It may be that the manner in which a person views their failures and mistakes is the most significant factor and determines whether advances in performance are made. That is, if negative self-monitoring is conducted in a positive and constructive fashion, achievements should be made; however, if there is no emphasis on the positive and performance error is viewed simply as failure then it should be expected that the learner will be discouraged and may therefore experience performance decrements. Bandura (1991) has related that dysfunctions in the self-regulation process may cause individuals to judge themselves rather severely resulting in self-devaluation.

Also in this experiment, attentional focusing, a task-oriented strategy, was studied whereby learners were instructed to direct or orient their attention to the

demands of the task. Typical strategies that may be thought of as task-oriented are related to the ability to make quick decisions and problem solve throughout dynamic fast-paced sport situations. The ability to identify and utilize relevant visual cues is essential to making decisions and solving problems in an efficient manner, thus improving overall task performance. In this context, focusing is considered to be a task-oriented strategy as it is based upon the demands of the task. More specifically, focusing relative to this experiment involved selectively attending to various aspects of the task such as the speed, angle, arc, and direction of the ball as well as location of the opponent.

Experiments conducted by Singer, DeFrancesco, and Randall (1989) and Singer et al. (1989a, 1989b) have indicated that focusing, when combined with additional strategies, served to improve performance in a variety of motor tasks. Research by Gal-Or et al. (1986) has revealed that attentional focus and positive self-talk combined enhanced performance for elite orienteers. Singer (1988) has stated that "focusing orients attentional capacity to an isolated cue and helps the athlete cope with and block out internal and external distractions" (p. 57). Approaches to teaching attentional focusing strategies can be based on research associated with various theories and models of selective attention (see Abernethy, 1993).

Inherent Problems

The classification of strategies as either self-directed or task-oriented is not without problems. Many strategies studied and reported in the research literature may be neatly classified as either self-directed or task-oriented. To help clarify this concern, Carver and Scheier (1981) have stated that people may "selectively attend to information that originates from within and concerns the self" or "selectively attend to information originating in the environment" (p. 35). These are termed self-focus and environment focus, respectively. However, they further state that attention is not exclusively focused within the self or towards the environment. That is, selectively attending to an environmental stimulus (environmental focus) may serve to draw our attention to the self (self-focus). The implication from the ideas of Carver and Scheier is that strategies should be classified as primarily, but not exclusively, self-directed or task-oriented. Imagery is a prime example to illustrate this point. Imagery may be perceived as primarily self-directed since it may be used internally (i.e., visualizing oneself performing the task while feeling the movement). Yet, imagery may also be perceived as primarily task-oriented when performers visualize the successful execution of a task from the standpoint of an observer.

Because investigators may not always be in complete agreement as to how a strategy should be classified, different interpretations of findings and confounding results may appear in the literature. Therefore, researchers will need to (a) explicitly state in the literature whether a strategy was used in a self-directed or task-oriented manner, (b) justify why the strategy was classified as self-directed or task-oriented, and (c) provide specific protocols used in experiments.

Not only is there a shortcoming with the use of a strategy classification system, but there is a methodological problem that should be considered when conducting research. This problem concerns the use of self-directed and task-oriented strategies in combination while disregarding the individual impact of strategies on skill level, and how a combined strategy may serve to confuse the interpretation of research results. In other words, if self-directed and task-oriented strategies are utilized in combination for different levels of skill, it will not be readily apparent which type is more beneficial for the advancement of skill level.

Several studies (Fenker & Lambiotte, 1987; Mace et al., 1986; Singer, DeFrancesco, & Randall, 1989; Singer et al., 1989a, 1989b) have examined the combined effect of self-directed and task-oriented strategies on achievement while ignoring how individual strategies affect overall skill

level. Using self-directed and task-oriented strategies in combination confounds the impact of individual strategies and provides no information as to whether these strategies may differentially benefit task execution for beginning and advanced performers. Therefore, in attempting to ascertain which type of strategy category (self-directed or task-oriented) is best for beginning versus advanced performers, future research will need to be conducted which examines the impact of these strategies, individually and in combination, on performance. Only with several such investigations can conclusions be derived regarding whether self-directed, task-oriented, or self-directed and task-oriented strategies combined are more beneficial for beginning and advanced performers.

Theoretical Foundation

Due to the study of a wide variety of strategies, this experiment was based upon several theories and learning models. More specifically, this section deals with a discussion of self-efficacy theory, self-regulation models, as well as selective attention theory and models in reference to the strategies chosen for this experiment. Furthermore, a brief discussion of Fitts and Posners' (1967) three stages of learning will be presented in this section.

Self-Efficacy Theory

Self-efficacy theory states, according to Bandura (1977), "that psychological procedures, whatever their form,

alter the level and strength of self-efficacy" (p. 191). An individual's expectations of self-efficacy (i.e., a belief that he/she can successfully carry out a behavior needed to yield a certain outcome) will determine whether or not coping behaviors will be used, the amount of effort that will be spent, and the length of time self-efficacy will be maintained when confronted with negative experiences. In Bandura's model, expectations of self-efficacy may be obtained from four different sources: (a) verbal persuasion (i.e., self-instructions), (b) physiological states (i.e., relaxation and biofeedback), (c) vicarious experiences (i.e., live modeling), and (d) performance achievements (i.e., personal accomplishments). Bandura has stated that greater modifications in perceived self-efficacy will occur as individuals increasingly experience these four sources.

Self-efficacy theory (Bandura, 1977) is based upon the assumption that there is a variety of psychological techniques that may produce and strengthen a person's expectations of self-efficacy. Self-efficacy deals with how effective a person believes himself or herself will be in the attainment of a desired goal. Individuals with high self-efficacy believe in their ability to accomplish goals with successful results. In contrast, persons with little confidence in their ability to achieve goals have low self-efficacy. In this case, self-efficacy may be enhanced through the use of constructive self-monitoring. That is,

the learner develops a greater sense of self-awareness in terms of their achievements and views performance error in a positive light.

Bandura (1977) has suggested that the enhancement of a person's sense of self-efficacy determines how strong personal efforts will be in attempting to attain goals. A high sense of self-efficacy (i.e., greater self-confidence) should result in more persistence for success in contrast to lower levels of self-efficacy. Thus, the more a performer persists with a task, the higher the probability for successful performance in that task.

The notion of self-efficacy is an important factor in social cognitive theory which was originally proposed by Bandura (1986). The basic idea behind social cognitive theory is that people self-regulate behavior through processes of self-observation, self-judgement, and self-reaction. Essentially, the 'self' is a significant influence in terms of regulation and motivation of behavior. Relative to social cognitive theory, Bandura (1991) has argued that self-efficacy determines how individuals self-monitor their performance and how successes and failures are attributed. Persons with low self-efficacy view a poor performance as the result of low ability whereas those individuals with a high sense of self-efficacy interpret poor performances to low effort.

However, for the purposes of this research, it is argued that the self-monitoring process in turn affects one's level of self-efficacy. Accurate self-monitoring of performance and behavior via self-observation and self-recording, as stated earlier, increases a sense of self-awareness in individuals in terms of achievement and lack of accomplishment. If the self-monitoring process as a whole is executed positively, then self-efficacy should be raised regardless of performance error. The basic premise here is that self-monitoring should elevate self-efficacy and a higher self-efficacy should then serve to advance skill level.

Schunk (1989), in a review of social cognitive theory, has indicated that self-regulation as a whole can impact upon self-efficacy. Learners who feel that progress is being made toward goal achievement are more likely to feel self-sufficient in continuing to reach their goals. To illustrate that self-observation of progress affects self-efficacy, Schunk (1983) administered three monitoring techniques (self, external, control) to children attempting to solve subtraction problems. It was found that both self- and external monitoring increased skill and perceived level of self-efficacy and provided the children with a measure of the learning process.

Self-Regulation Models

Crews (1993) has stated that "self-regulation refers to

automatic functioning without the use of external controls" (p. 557). Self-regulation is partly founded in cybernetic theory which introduces various mechanisms to interpret the self-regulation process. Kirschenbaum (1985, 1987) has proposed a five stage model of self-regulation. These five stages include: (1) establishing the identity of the self-regulation problem, (2) committing to modifying the problem, (3) using self-monitoring and self-evaluation methods to change the identified problem, (4) managing the environment, and (5) generalizing self-regulatory behavior change.

Generally speaking, problem identification involves recognizing those areas of performance or behavior that need to be corrected. Once the problem areas have been identified, the individual must be committed to making the necessary behavioral changes. Next, performance modifications are made using self-regulation methods in a positive and constructive environment. Finally, constructive behavioral changes should be generated to future situations.

According to Carver and Scheier (1981), principles from cybernetic and control theory have significant implications for the regulation of human behavior. Crews (1993) and Robb (1972) have stated that cybernetic theory endeavors to explain how closed-loop systems self-regulate with the use of negative feedback loops. Carver and Scheier (1981) have also discussed negative feedback loops and the TOTE unit

(test-operate-test-exit) originally proposed by Miller, Galanter, and Pribham (1960). Closed-loop systems involve input (i.e., information) into the system, processing of the input, output of the system in the form of a response, and feedback to the system that can be used to detect and correct response error. Stated very simply, the output of an ideal closed-loop system alters its input through error detection and subsequent corrective procedures. This process continues until a correct response is executed.

An example of a negative feedback loop that is frequently used is a thermostat. The thermostat continuously compares the air temperature with that of a pre-established standard. If a discrepancy is detected, the thermostat is activated until the perceived variation is negated. This is the same idea behind the TOTE unit of Miller et al. (1960) in which the test compares an existing condition with a preset standard. If error is detected, the test operates until a state of equilibrium is attained between the present condition and desired standard (defined as test-exit). Essentially, this is what occurs when performers use self-regulation procedures appropriately during or following the execution of a task. Once a task is performed, error feedback produces signals that indicate the kinds of internal changes needed to be self-corrected by the performer. Good performers continuously self-monitor, evaluate, and take corrective measures as needed.

Carver and Scheier (1981) have proposed a closed-loop, negative feedback model of behavioral self-regulation which consists of four functions: (1) an input function (perception), (2) a comparator (test), (3) an output function (operate), and (4) behavioral impact. Each of the four functions plays an important role in self-regulation. If a breakdown occurs within the model, self-regulation ceases as a process.

Disruptions may occur at any point in the closed-loop model. First, in the absence of input, new behavior may not be produced as there is nothing to compare to a behavioral standard. To illustrate, suppose a coach instructs an athlete to improve a particular aspect of his or her performance, yet no feedback is provided by the coach to the athlete. The athlete would be unable to make the appropriate modifications as there would be no feedback to compare with a performance reference or standard. Second, self-regulation cannot function in the absence of a standard or reference point. An example of this case would be a young ballet dancer attempting to perform an arabesque without ever having seen the execution of this step. The dancer would not know where or how to start. Third, if the output function is disrupted, behavioral changes may not be produced when summoned by the comparator. For instance, a performer may identify a performance problem and wish to use self-monitoring to modify it; however, he or she does not

understand how to self-regulate. Therefore, performance changes cannot be made. Finally, self-regulation will no longer function if the comparator is disrupted. This could occur in the absence of a standard or perceptual input. In general, Carver and Scheier (1981) have stated that the presence of self-focus or self-directed attention is crucial for the self-regulation process to occur.

Self-regulation theories, as those just discussed, are based on control systems using negative feedback. However, a major problem exists with these theories with respect to human behavior. Within the framework of social cognitive theory, Bandura (1991) has pointed out that negative feedback control systems are not characteristic of humans when it comes to goal setting and motivation. That is, modifications will be made only when performance does not match internal performance standards. This implies that no further actions are required of individuals once the performance goal is attained (i.e., when performance matches the internal reference point).

Bandura's (1991) model of self-regulation, as stated earlier, consists of three major constructs: self-observation of behavior (i.e, self-monitoring), self-judgement, and self-reaction. He has proposed that human behavior is regulated by the interaction of both the 'self' (cognitions) and environmental sources. Therefore, in contrast to negative feedback systems, Bandura has suggested

that humans operate under proactive control and reactive control. People set specific performance goals to be achieved (i.e., proactive control) which serve to disrupt the state of balance or equilibrium. Feedback is then employed to assist in the acquisition of those goals (i.e., reactive control) to achieve equilibrium. Upon reaching the desired goals, those individuals with higher levels of self-efficacy will then set higher goals to be mastered, thus starting the whole process over. Primarily, Bandura has pointed out that negative feedback may serve to guide individuals in acquiring goals; however, occasionally the negative feedback loop must be surpassed to create further demands and challenges.

Selective Attention Theory/Models

Abernethy (1993) has reviewed several models of selective attention, including filter models (Broadbent, 1958; Deutsch & Deutsch, 1963), an attenuation model (Treisman, 1969), and pertinence-based models of selective attention (Norman, 1968) which may serve to explain the successful use of an attentional focusing strategy in motor performance situations. Selective attention is the ability to attend to relevant information while disregarding unimportant or distracting information that may occur in an external environment (i.e., visual or noise distractors) or internally within a person (i.e., irrelevant thoughts, anxiety, fears, self-doubt). Distracting information

(irrelevant cues) serve to interfere with the processing of meaningful information, thus impairing performance.

Abernethy has stated that the effectiveness of selective attention in a sports situation depends upon (a) the entire quantity of information presented within a display, (b) the amount of time necessary to acquire and process the most relevant information, and (c) the capability of the performer.

There is research that seems to indicate that the ability to selectively attend to relevant information in the environment can improve with practice and training. Higher skilled athletes appear to pick up meaningful information in the environment more effectively than novices. Studies involving badminton (Abernethy, 1988; Abernethy & Russell, 1987) have yielded evidence that there are subtle differences between experts and novices in their ability to anticipate factors such as the speed and direction of the shuttle being hit to them. Similar results were found by Abernethy (1990) when expert and novice squash players were compared. Differences in the ability to anticipate appear to be related to dissimilarities between the experts and novices in using advance cues to make fast and accurate decisions. Abernethy (1993) has stated that attending to meaningful information permits motor responses to be initiated earlier in time and reduces the information processing load due to the recognition of excess or

redundant information in the environment.

Singer, Cauraugh, Tennant, et al. (1991) have suggested the use of attentional focusing during performance as a means of minimizing both internal and external distractors. The ability to focus attention on appropriate aspects of a task is crucial for effective execution of that task. However, the manner in which one uses attentional focusing is important to consider. Basically, performers need to focus on the positive aspects of performance and the correct movements to make rather than on poor performance.

In an extensive review on selective attention and distractors, Singer, Cauraugh, Tennant, et al. (1991) have addressed the issue of attentional training and the possible effects on distractors and performance. These authors have stated that attentional training methods more than likely improve the ability to focus on appropriate cues and reduce the negative effects of distractors. However, few investigations have been conducted in the area of attentional training and what little research has been done indicates that strategies (relaxation, imagery, focusing), for learning and performance, may enhance attention when used individually or in conjunction with each other.

Singer, Cauraugh, Murphey, et al. (1991) have indicated that attentional training in the form of relaxation, imagery, and attentional focusing and refocusing resulted in greater accuracy and consistency in an underhand ball

tossing task as compared to no-attentional training groups. Furthermore, groups receiving attentional training experienced superior performances in the presence of visual and/or auditory distractors relative to no-attentional training, no distractor groups. This latter finding implies that attentional training served to enhance performance by reducing the effect of various types of distractors.

Earlier experiments by Singer, DeFrancesco, and Randall (1989), Singer and Suwanthada (1986), and Singer et al. (1989a, 1989b) have shown that exhaustively focusing attention on one relevant task cue combined with additional strategies tends to improve performance in self-paced motor tasks. Novel tasks were used in these studies, thus implying that beginners may effectively learn to use focusing to their advantage if properly trained.

Gal-Or et al. (1986) and Mahoney (1984) have also advocated the use of attentional focusing as a strategy for performance enhancement. Mahoney (1984) has reported five effective techniques for attentional regulation in athletes. These techniques include:

- (1) practice concentrating on the immediate task and avoid thoughts of evaluation by a coach, (2) the optimal focus of attention (broad versus narrow) may depend on the performance, (3) attention should be concentrated on the here and now rather than on earlier or forthcoming aspects of the competition, (4) the athlete's ability to concentrate may be facilitated by prior training in which intentional distractions are gradually introduced into practice and accelerated as the athlete becomes

progressively more proficient in attention regulation, and (5) practice in attention related skills such as meditation may be useful. (p.24)

With regard to orienteering, Anthony (1981) has stated that "efficient orienteering requires a positive mental approach, an ability for quick decision making, self-reliance, keen observation, ability to remain undisturbed by external stimuli, ability to concentrate and a good focus of attention to details" (cited in Gal-Or et al., 1986, p. 40). The ability to make fast decisions or to execute when sufficient time is available reflects, in part, attention to meaningful cues in the environment. It is important in all achieving situations.

Singer, Cauraugh, Tennant, et al. (1991) have essentially stated that further research in the area of attentional training is needed. Moreover, specific questions should be addressed such as whether attentional training can generate to similar tasks and whether it is possible to instruct individuals in the use of strategies to direct their attention across a variety of tasks.

Stages of Learning

Fitts and Posner (1967) have proposed a three stage model for learning motor skills. This model, which is based upon information theory, consists of an early phase, intermediate phase, and late phase. All three stages exist along a continuum (i.e., they are not independent entities). A review of them provides a helpful framework before

proceeding with a discussion of the strategy literature relative to skill level.

The early phase, also referred to as the cognitive stage, requires the use of cognitive processes to a large extent. In this phase, the learner is concerned with 'what to do', that is, what rules must be followed, what the correct movements are to be executed, and what conditions are present. Learners characteristically rely heavily upon the instructor for information as to what to do and what is expected of them. More than likely, beginners would be more successful in self-paced motor activities as there is an indefinite period of time in which to prepare and to consider what needs to be done to perform the skill.

The intermediate or associative phase follows the cognitive stage. At this point in the learning process, learners are more concerned with 'how to do' the task; what practice conditions and procedures are most beneficial to realize intended performance outcomes. Performance level improves and becomes more consistent.

Transition into the late or autonomous phase occurs when responses can be issued as if automatic. Performers pay less attention to their basic actions, thus allowing them to be aware of more relevant situational cues, as in dynamic, externally-paced conditions. Performers are able to recognize and correct performance errors when they occur. Moreover, performance is consistently at a high level with

very little variability.

It is evident from Fitts and Posners' (1967) work that skill progresses along a rather long continuum from a true beginner to an elite performer. The point at which the early phase ends and the intermediate phase begins is not clearly defined in the learning process. Likewise, the point in time where the intermediate phase terminates and the late phase commences is not distinct. Each stage of learning is distinct in terms of the demands made upon the learner/performer. In terms of strategy use, there is the possibility that certain types of strategies are more beneficial or advantageous for performance depending upon skill level. At this point, a review of strategy use by beginning and advanced performers will be presented.

Strategy Research Relative to Level of Skill and Type of Task

Skill Level

An extensive body of literature has been produced about strategy use and skill level. However, research findings are not consistent and this is especially true for novice and beginning performers. It is unclear whether a strategy that involves a self-directed approach, a task-oriented approach, or a combination of the two results in greater performance enhancement. A discussion of the research relative to advanced athletic performers will be presented first as the findings are less obscure when compared to novice or beginning performers.

It should be kept in mind while reading this review that the strategies reported in the research were not actually classified by the respective investigators as either self-directed or task-oriented. I have made an attempt to label certain strategies as self-directed or task-oriented solely for the purpose of obtaining an overall picture of how the self-directed and task-oriented classification system interacts with skill level. Furthermore, it is not expected that all researchers will agree with how these strategies were classified for this review.

Research with advanced and beginning performers has indicated that a great variety of strategies have been studied in order to determine better approaches to improve performance. Strategies classified for the purpose of this review as self-directed include relaxation, positive self-statements, readiness, self-instructions, self-monitoring, self-evaluation, and preparatory arousal. Strategies classified as task-oriented include imagery (subjects were instructed to image the task), executing, reliving of prior successful performances, attentional focusing, and task-relevant statements. Other strategies (also reviewed in the literature) include instruction drills, feedback from coaches, modeling, and role-playing skills.

Advanced performers. Athletes appear to benefit more from a combination of self-directed and task-oriented

strategies rather than either type alone. For instance, Weinberg et al. (1981) have reported that athletes competing in karate performed best when using visuo-motor behavior rehearsal (VMBR) which is a combination of both imagery and relaxation. Corresponding results were found by Wrisberg and Anshel (1989) for young athletes using a combination of imagery and relaxation prior to executing free throws in basketball.

From a practical standpoint, Martin and Lumsden (1987) have suggested that athletes in preparation for competition may benefit from a variety of self-directed strategies (relaxation techniques, positive self-statements) and task-oriented strategies (imagery, reliving of prior successful performances). Gould, Hodge, Peterson, and Giannini (1989) as well as Weinberg, Grove, and Jackson (1992) have determined that coaches teach a variety of self-directed (positive self-talk, relaxation) and task-oriented (instruction drills, imagery) strategies in combination to promote self-efficacy in athletes. Furthermore, Mahoney (1979, 1984) has discussed the use of self-efficacy statements and arousal regulation (self-directed approach) as well as imagery and attentional focusing (task-oriented approach) as viable strategies to elevate achievement level.

Research by De Witt (1980) has shown positive performance results for university level football and basketball players who used mental rehearsal, relaxation,

positive self-statements, and biofeedback training in combination. Meyers, Cooke, et al. (1979) have found that higher skilled racquetball players reported the activation of greater self-talk while training and competing and, furthermore, maintained attentional focus on subsequent shots to be performed. Comparable results were reported by Gal-Or et al. (1986) who have established that elite orienteers make use of both positive self-talk and attentional focus.

Further research by Mace et al. (1986) has revealed that a combination of both positive self-statements and imagery as a self-management technique enhanced performance for a young gymnast. Similar outcomes were found for a male gymnast (Mace et al., 1987) and an Olympic archer (Houghton, 1991) using positive self-statements, relaxation, and visualization as a means for reducing stress. Fenker and Lambiotte (1987) have reported that performance was heightened for college football players who followed imagery, readiness, and relaxation techniques to achieve focused attention. Likewise, combining relaxation, imagery, and self-instructions was found by Meyers and Schleser (1980) to improve performance for a college basketball player, while Noel (1980) has discovered that VMBR improved tennis performance for high ability players. The use of self-monitoring along with instructions and feedback from coaches were ascertained by Hume et al. (1985) to elevate

the quality of freestyle figure skating for three pre-novice figure skaters. Finally, a series of experiments by Rushall et al. (1988) have produced findings that skiing performance improved when elite cross country skiers issued positive self-statements, task-relevant statements, and mood words.

Overall, it is apparent from the literature that advanced performers benefit from a wide variety of self-directed and task-oriented strategies when employed in combination. However, additional research is needed to determine if self-directed and task-oriented strategies should primarily be utilized in combination or whether there are specific self-directed or task-oriented strategies that may be successfully used individually for performance enhancement.

Beginning performers. Research results are much more equivocal when self-directed and task-oriented strategies are used in combination by novice or beginning performers. This may be due to (a) methodological problems, (b) weak protocols for strategy treatment, or (c) the possibility that strategies may not have been well-learned. For instance, Gray (1990) has found that VMBR, combined with a videotaped model, appeared to improve the forehand stroke for beginning racquetball players when compared with imagery or relaxation alone. Similarly, several experiments involving the Singer Five-Step Strategy (readying, imaging, focusing, executing, and evaluating) have yielded results

that indicate performance can be improved when subjects attempt to learn novel tasks (Singer et al., 1989a, 1989b; Singer et al., 1993; Singer, DeFrancesco, & Randall, 1989; Singer & Suwanthada, 1986). The Singer Five-Step Strategy clearly combines both self-directed (readying, evaluating) and task-oriented (imaging, focusing, executing) strategies.

In contrast, there is evidence which fails to support the use of combined self-directed and task-oriented strategies with novices and beginners. For example, Noel (1980) has reported that low ability tennis players experienced a decrease in performance when VMBS was used as a treatment. Meyers, Schleser, et al. (1979) have failed to produce evidence indicating that the combined use of imagery and self-instructions significantly facilitated performance for beginning gymnasts. Upon comparing the Singer Five-Step Strategy to three of its substrategies, Weigand et al. (1992) did not find differences among the conditions in influencing the golf swing.

With traditional motor behavior laboratory tasks (stabilometer balancing and a speed-of-movement ball snatch task), Weinberg, Gould, and Jackson (1980) have found no performance differences for participants reporting the use of one or more of the following task-oriented or self-directed strategies: attentional focusing, imagery, self-efficacy statements, relaxation, and preparatory arousal. However, it was determined that attentional focusing

(indicating a task-oriented approach) was used most often by subjects in both experiments. Similarly, the combined use of imagery, positive self-efficacy statements, and attentional focus did not improve tennis serve performance for low or high ability players (Weinberg, Gould, Jackson, & Barnes, 1980). Yet, the researchers noted that these results were possibly due to the participants not being properly trained in the application of these strategies.

Furthermore, as far as novice and beginning performers are concerned, there are many views supporting either a task-oriented or self-directed approach. Relative to a task-oriented approach, Martin and Lumsden (1987) have recommended the use of modeling, instructions, and role-playing skills for beginners. In a discussion on mental practice, Schmidt (1988) has stated that mental practice appears to have a greater effect on early practice when compared with later practice. Likewise, when discussing the use of mental practice techniques such as imagery, LeUnes and Nation (1989) have said that "there is some question about the usefulness of the approach when the elite athlete is being trained" (p. 90). In contrast to these opinions, Johnston-O'Connor and Kirschenbaum (1986) as well as Kirschenbaum et al. (1982) have advocated the use of positive self-monitoring (a clearly self-directed approach) for both unskilled golfers and bowlers. Performance improvements were observed for those who attended to the

positive aspects of their performance.

As can be seen, research dealing with strategy use and skill level has produced a variety of findings as to the types of strategies that may be preferred depending upon whether an individual is an advanced or beginning performer. Many of these results, especially for beginners, are not clear in terms of the type of strategy (self-directed or task-oriented) that is most beneficial for the improvement of skill execution. At this point, a discussion will be devoted to strategy use and type of task and the possible implications for level of skill and the strategies used in this investigation.

Type of Task

Magill (1993) and Singer (1980b) have proposed that psychomotor tasks may be classified according to the precision of movement (gross versus fine), the stability of the environment (self-paced, mixed-paced, or externally paced), and based upon beginning and end points (discrete, serial, or continuous). Furthermore, tasks may be categorized relative to their overall duration (i.e., short/rapid versus extended/slower events). For this investigation, a discussion of strategy use will be presented relative to the demands made upon the learner/performer (i.e., self-paced versus externally paced) and the duration of the task (i.e., brief versus extended events).

Self-paced versus externally paced tasks. Self-paced tasks (also referred to as closed motor skills) may be defined as those tasks which are performed in stable, unchanging, predictable environments in which the pace is set by the individual performing the task. In other words, the learner/performer may execute the task whenever he or she is ready to do so. There is ample time to prepare for task execution in the absence of external demands or requirements. Beginners and novices are more apt to perform self-paced skills better than externally paced tasks because they are in complete control of the situation and are not required to anticipate or make quick decisions. Examples of self-paced tasks in sport include tennis or racquetball serves, golf, bowling, and archery.

On the other hand, externally paced tasks (also referred to as open motor skills) are performed in ever-changing, unstable environments. The pace of the task is determined by the environment rather than by the individual executing the skill. Essentially, the learner/performer makes a response according to the demands placed upon them by the environment. Performers must frequently be able to anticipate, execute quick decisions, and adapt to the situation for a successful performance to occur. Examples of externally paced tasks include a tennis or racquetball rally, driving a car, or firing a gun at a moving target.

The majority of strategies have been demonstrated to raise performance levels when the skill involved is self-paced. This is primarily due to the fact that the learner/performer has plenty of time to think about how to execute the skill and is not required to anticipate or make quick performance decisions as in externally paced skills. The Singer Five-Step Strategy (Singer & Cauraugh, 1985) is an example of a global strategy comprised of both self-directed and task-oriented strategies. This particular strategy was proposed for the learning and performance of self-paced motor tasks. Individuals employing this particular strategy have plenty of time to ready for performance, image the skill to be executed, focus on one relevant aspect of the task, execute when ready, and self-evaluate each performance. Essentially, both self-directed or task-oriented strategies, including self-monitoring and attentional focusing, may be beneficial to a certain extent when completing self-paced tasks. Singer, Cauraugh, Tennant, et al. (1991) have remarked that task-oriented strategies, such as attentional focusing, are appropriate for self-paced tasks. However, they have stated that strategies of a self-directed nature should be used with caution as performance may be impaired due to an awareness of internal states which may be distracting for effective task execution.

With respect to externally paced tasks, very few strategies have been identified as possibly raising performance levels. Because externally paced skills are executed in response to environmental demands, the speed at which they are performed may be rapid. Carver and Scheier (1981) have stated that as skills to be executed become increasingly faster or complex, attention is directed primarily to the environment and away from the self due to a greater processing demand. The implication from this statement is that strategies that are task-oriented, such as attentional focusing, may be more appropriate for externally paced skills as compared with self-directed strategies.

As previously noted, research has shown that elite badminton players (Abernethy, 1988; Abernethy & Russell 1987) and elite squash players (Abernethy, 1990) are better able to attend to and anticipate such factors as speed and direction and are better able to make quick and accurate decisions when compared to novices. This would indicate that the ability to selectively attend to appropriate cues and the ability to anticipate are advantageous strategies for advanced performers and in the execution of externally paced skills. Singer and Cauraugh (1985) have related that anticipatory behaviors may lead to success in externally paced skills.

The greatest problems with respect to selective attentional focusing and externally paced skills are: (1)

deciding exactly what aspects (cues) advanced performers focus their attention toward and, if this is determined, (2) developing adequate procedures for teaching beginning performers to attentionally focus and anticipate movement in a similar mode. This is essentially what studies in visual scanning are attempting to accomplish. For instance, Cauraugh, Singer, and Chen (1993) have used visual scanning equipment to identify the primary visual cues that elite and novice tennis players selectively attend to throughout the decision making process. Abernethy (1990) has conducted a similar experiment with squash players. The primary goal of such experiments is to determine the visual cues that raise performance levels. It remains to be seen whether or not beginners can acquire the attentional focusing abilities of higher skilled performers.

Short/rapid events versus extended/slow events. Motor tasks may also be categorized according to their length and speed (i.e., brief/rapid versus extended/slower events). Examples of brief or quick events in sport include serving a tennis ball, hitting a baseball, and various weight lifting events such as the overhead press. Extended or slower events include such activities as marathons, cross country skiing, and orienteering.

The use of strategies should be more useful for extended, slower events as there are longer periods of time to monitor feedback and to utilize these strategies.

Generally, strategy use may occur over the course of the event to be performed. That is, strategies may be incorporated into the task. With respect to slower events, Singer and Cauraugh (1985) have remarked that individuals can "monitor feedback but must learn strategies as to what to pay attention to, when, how often, and to what extent during the completion of the activity" (p. 106). Because feedback is being monitored, it may be implied that self-directed strategies are the preferred technique for performance enhancement (for example, self-monitoring). However, task-oriented strategies may play an important role in slower events depending upon the nature of the skill being performed. Extended events such as marathons and cross country skiing may be considered self-paced as the performer may set the desired speed of the activity and attend to feedback. Yet, these same events may be considered to be externally paced as they are performed in unpredictable environments. Thus, task-oriented strategies (attentional focusing) may be necessary for successful task completion.

By comparison, shorter or more rapid (ballistic) events are concluded rather quickly making it more difficult to use a strategy. Because the activity is quite short in duration, it is virtually impossible to monitor or attend to feedback during the performance. Therefore, strategy use is more likely to occur just prior to or upon conclusion of the

event in question. Because the pace of the event is rapid, task-oriented strategies (attentional focusing) are probably more likely to be utilized as attention is directed away from the self and more toward the environment. Yet, self-directed strategies may be employed upon completion of the task in the form of self-evaluation.

This investigation involved both self-paced and externally paced skills as well as brief and extended events in the form of racquetball skill tests and a modified play situation. From the prior discussion, it is apparent that self-directed and task-oriented strategy use may be dictated by the type of task. Self-directed strategies (for example, self-monitoring) may be more characteristically used in self-paced or extended activities, while task-oriented strategies like attentional focusing may be beneficial for persons executing self-paced, externally paced, and brief events.

Concluding Remarks

With respect to research on advanced performers, it is apparent that both task-oriented and self-directed approaches improve athletic performance in the execution of different types of tasks. However, it is not clear which approach is more beneficial to performance (i.e., self-directed or task-oriented) or whether they are equally important for performance enhancement (i.e., self-directed and task-oriented combined). The use of the self-directed

and task-oriented strategy classification system should clarify this issue with respect to higher skilled athletes.

As far as novice or beginning performers are concerned, research findings should be less equivocal if investigators employed the self-directed and task-oriented classification scheme. It is not readily apparent from the literature whether a self-directed or task-oriented approach is more beneficial for beginners or whether a combination of the two approaches will best lead to accomplishment for different kinds of skills. Research results have indicated that in certain instances a combination of self-directed and task-oriented strategies are more advantageous while other studies have yielded opposite findings. Likewise, there are those who have advocated a self-directed approach while others have supported a more task-oriented approach for novices or beginners. Furthermore, there are investigations that have not provided evidence that strategies (whether self-directed or task-oriented) enhance performance to any degree. However, in the absence of a strategy treatment effect, perhaps it may be concluded that strategy treatments were either not properly administered or were not strong enough to result in a treatment effect.

Researchers using a self-directed and task-oriented classification system for strategy investigations should be able to better determine whether a combination of the two approaches is more advantageous for novice or beginning

performers or whether one approach is more beneficial. The important concept to remember is that, within a classification system framework, strategy protocols will need to be standardized so that findings will be clearly understood. At the present time, however, one can only examine the research somewhat superficially and try to determine the trends that are evident from the findings.

This investigation has utilized the self-directed versus task-oriented strategy classification system. The significance of this study is that it is the first strategy investigation, using various types of tasks, to include a classification system for examining relative contributions to achieving in motor skills. Therefore, the findings are interpreted within a meaningful conceptual framework.

The primary purpose of this study was to determine if beginning racquetball players and advanced racquetball players benefit equally from the use of self-directed strategies, task-oriented strategies, or a combination of the two strategy types. The results should yield important information for coaches and athletes, as well as teachers and recreational sport participants.

CHAPTER 3

METHODS

Participants

Male racquetball players ($N = 80$) enrolled at the University of Florida and Santa Fe Community College were asked to volunteer for this study. They were recruited from Sport and Fitness classes as well as theory classes within the Departments of Exercise and Sport Sciences and Psychology, and community education classes in racquetball. They were screened for skill level according to their level of play, the number of years they have been playing racquetball, and by performing a short rally skill test (described in the procedures section). The screening scores were compared to established rally test norms for each level of skill. Additionally, demographic data were collected on all participants to assist in the establishment of level of play. No subject had prior knowledge about the nature of the treatments or the hypotheses for this experiment. Everyone read and signed an informed consent form prior to the start of the study (see Appendix A) and completed the form on demographic data (see Appendix B).

The number of subjects assigned to each treatment cell was determined by using Cohen's (1977) tables. The values

used for determining sample size were: $\alpha = .05$ (predetermined level of significance), $u = 7 (k - 1)$, $f = .45$ (large effect size), and a power of .80. A table value of $n = 10$ was obtained based upon the specifications for this experiment. Subjects ($n = 10$) were randomly assigned by skill level (beginning, advanced) into one of four strategy treatment conditions (self-directed, task-oriented, combined self-directed and task-oriented, and control).

The demographic data for beginners ($M = 24.85$ years of age) indicated that 52.5% played racquetball less than once per week, while 27.5% and 20% played an average of 1-2 and 3-4 times per week, respectively. The average number of years for playing was ($M = 0.71$ years) for three-wall racquetball and ($M = 2.67$ years) for four-wall racquetball. Regarding tournaments, only 12.5% indicated previous tournament experience. Relative to level of play, 20% perceived that they were B level players, while 55% and 25% believed they should be classified as C and D level players, respectively. Approximately 87.5% of beginners were right-handed.

The demographic data for the advanced level players ($M = 23.50$ years of age) revealed that 35% played racquetball less than once per week, while 35% and 30% estimated playing time averaged between 1-2 and 3-4 times per week, respectively. The average number of years for playing was ($M = 1.39$ years) for three-wall racquetball and ($M = 4.24$

years) for four-wall racquetball. Only 15% of these players reported tournament experience. Level of play was indicated as follows: (a) level of play (A) = 2.5%, (b) level of play (B) = 57.5%, (c) level of play (C) = 30%, and (d) level of play (D) = 10%. Approximately 92.5% were right-handed.

Subject dropout and the rejection of players by the experimenter did occur. However, both instances were relatively rare considering the magnitude of the study. Subject dropout for visit two (i.e., transfer phase) was relatively low. Missing data were present for seven participants: (a) beginners ($\underline{n}$ = 3, task-oriented group; $\underline{n}$ = 2, combined group), and (b) advanced players ($\underline{n}$ = 1, self-directed and task-oriented groups). Regarding player rejection, eight were discarded from the experiment due to attitude problems ($\underline{n}$ = 1) or being too highly skilled ($\underline{n}$ = 7).

Court Specifications

The three-wall (short sidewall) racquetball courts at the University of Florida were used as the testing area. Appendix C provides court markings and measurements and is based on a diagram by Moore, Scott, and Porterfield (1987). Court markings on the three-wall racquetball courts are located as follows:

Back court: The back court is the area of play located between the receiving line and long line.

Diagonal lob line: The skill test line for the lob

serve is located halfway (2.44 m) up the front wall.

Drive serve lines: The lines forming the drive serve zone, are parallel with the side wall, and are within the service zone (American Amateur Racquetball Association, 1994).

Front court: The front court is the area of play located between the front wall and service line.

Long line and side lines: The long line and side lines mark the posterior and lateral edges of the three-wall racquetball court, respectively.

Receiving line: The receiving line is a broken line which runs parallel to the short line (American Amateur Racquetball Association, 1994).

Service boxes: Service boxes are located at each end of the service zone and are designated by lines parallel with the side walls (American Amateur Racquetball Association, 1994).

Service line: The front edge of the service line is parallel with and in front of the back edge of the short line (American Amateur Racquetball Association, 1994).

Service zone: The service zone is the area between the outer edges of the short line and service line (American Amateur Racquetball Association, 1994).

Short line: The back edge of the short line is located in the center of the court and runs parallel to the front wall (American Amateur Racquetball Association, 1994).

Skill boxes: Skill boxes are located on both sides of the posterior racquetball court. The dimensions of each box are 2.13 m (length) x 2.13 m (width). Each skill box was divided into seven horizontal sections by the experimenter measuring .3048 m in width.

Equipment

Ball

According to the official rules of the game, the standard racquetball is 5.72 cm in diameter and weighs approximately 39.69 grams. Typical brands include Wilson or Penn ultra-blue, pressure-less racquetballs. The racquetballs used for this study were initially brand new balls and were replaced as necessary.

Racquet

Mid-sized and over-sized racquets were the preferred type of racquet for this study (see procedures for screening of racquets). According to the official rules, the racquet frame should include a thong to be securely attached to the player's wrist and the strings must be made of gut, monofilament, nylon, graphite, plastic, metal, or a combination thereof. The dimensions of the racquet should be as follows: (1) the head should be 34.29 cm or less in length, (2) the head should be 22.86 cm or less in width, and (3) the handle should not be greater than 17.78 cm in length.

Tasks

The tasks used for this study consisted of a racquetball skill test which included two sub-tests, retention tests for each skill test, and a modified play situation (a transfer task). Appendix D provides the general instructions that experimental and control groups received prior to the performance of each task. Appendices E and F reflect the basic performance steps that players should have observed when executing the two sub-tests (the diagonal lob serve skill test and the rally skill test). These performance steps, which were administered with the general instructions, played a critical role for effective strategy use by providing subjects with cues for the self-monitoring and attentional focusing processes.

Skill Tests

Diagonal lob serve. The diagonal lob serve requires that the player stand in one half of the service area and serve the racquetball (underhanded) so that it hits high on the front wall (above the diagonal lob line), travels in a high arc, and lands with a high bounce in the opposite back corner (skill box) of the court. A serve was also considered legal if it landed on the line defining the skill box. As previously stated, each skill box was divided into seven horizontal sections. These sections were assigned scores of 1 (located at the front of the skill box) to 7 (running parallel with the long line). The higher the

number, the better the score. Mean trial block scores consisted of the average number of correct serves executed by each player.

Rally. The rally skill test is a measurement test used to assess a racquetball player's ability to keep the ball in play. For a hit to be considered legal, the ball must remain in bounds and hit the front wall before hitting the floor. There were no restrictions on the number of bounces allowed prior to hitting a return rally. Furthermore, participants could not cross over the short line at any time during the skill test except to retrieve a ball. All initial hits that were legal were counted in the overall score. If the ball failed to return in the vicinity of the short line, they could move to the front of the court to retrieve the ball, but must return behind the short line to hit the ball once again. If they completely missed the ball, the experimenter provided them with another ball to put into play from behind the short line. Mean trial block scores consisted of the average number of correct hits executed by each player.

Modified play. The modified play situation consisted of three matches of three games (for a total of nine games) to 6 points and served as the transfer measure for experimental groups receiving strategies. Requiring subjects to play three games of 6 points, regardless of whether a player won the first two games, ensured that the

study was balanced by giving everyone an opportunity to play nine games.

Each game consisted of 6 points in contrast to 15 points played in an actual match. Each player competed once against three other players who received different strategies, but were of similar skill. For instance, a player receiving a task-oriented strategy competed against those who had received a self-directed strategy, a combined self-directed and task-oriented strategy, and no strategy. Mean trial block scores were calculated by totaling each person's cumulative game points for all games. Additionally, a won/loss record was recorded for each player. All games were played in accordance with the rules for three-wall racquetball established by the American Amateur Racquetball Association (1994).

Strategy-Use Scales

Experimental groups completed a strategy-use scale following the first, third, fifth, and eighth trial blocks of the diagonal lob serve skill test and rally skill test. They also completed strategy-use scales once both retention tests were administered and following the modified play situation. Each strategy-use scale (based on a semantic differential scale) reflected either a self-directed strategy condition, a task-oriented strategy condition, or a combined self-directed and task-oriented strategy condition and was designed according to the skill test to be

performed. A total of six strategy-use scales were used for this investigation (see Appendices G - L). The self-directed, task-oriented, and combined self-directed and task-oriented conditions each had separate strategy-use scales for each skill acquisition test and retention test that (a) ensured strategy use during the diagonal lob serve and rally skill tests, and (b) served as a strategy use check once both retention tests were completed. A total of three strategy-use scales were used in the acquisition and retention phases. Additionally, the self-directed, task-oriented, and combined self-directed and task-oriented conditions each had a separate strategy-use scale that was administered following the modified play situation (i.e., transfer phase) as a means of determining whether experimental subjects used their respective strategies.

The control groups had one general racquetball scale based on a semantic differential scale (see Appendix M). This scale was administered to them following the first, third, fifth, and eighth trial blocks of the two skill tests, after the retention tests, and upon conclusion of the modified play situation. The major purpose of the strategy-use scales was to ensure that experimental groups were using their respective treatments. The control groups completed the general racquetball scale to assure that the experiment was balanced (i.e., all groups received equal time completing scales).

Treatments

The four treatment conditions for this experiment were: (1) self-directed, (2) task-oriented, (3) self-directed and task-oriented combined, and (4) no strategy (control). Once experimental and control subjects read a general description of the study and signed the informed consent form, a detailed explanation of their respective strategy condition was provided in a written and taped format. Participants in the self-directed strategy condition received instructions explaining the self-monitoring process as well as how to use it during performance. Those in the task-oriented strategy condition received directions explaining attentional focusing and how to execute the strategy during performance. In the combined self-directed and task-oriented strategy condition, participants received instructions that were a composite of the self-directed and task-oriented strategy directions provided in the first two conditions. Those in the no-strategy condition were provided with general information concerning the sport of racquetball along with a diagram of the three-wall racquetball court and were instructed to perform to the best of their ability in the study.

Each group had approximately 15 min of strategy instruction. Appendices N, O, P, and Q explain in greater detail the treatments that were provided for experimental and control groups. Once the respective information for

each experimental and control group was received, a short quiz (see Appendices R, S, T, and U) was administered to ensure that they comprehended the treatments.

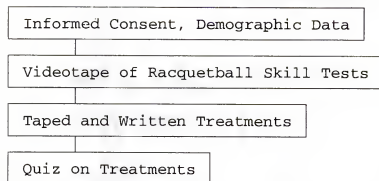
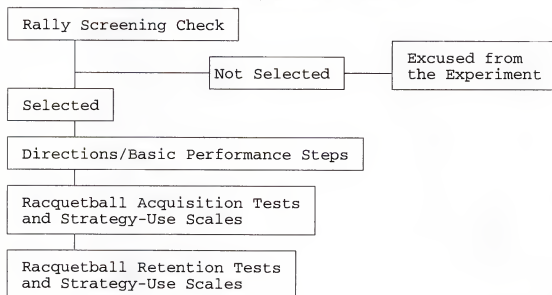
Subjects were verbally reminded by the experimenter to use their respective strategies throughout the diagonal lob serve skill test. These reminders occurred prior to the first trial block; upon the conclusion of trial blocks 2, 4, 6, 7, and 9; and after the fifth and tenth trials in each trial block. They were also verbally reminded by the experimenter to use their respective strategies prior to trial block 1 and following trial blocks 2, 4, 6, 7, and 9 of the rally skill test. For the modified play situation, participators were instructed to use their strategies, which were learned approximately 1 week earlier, prior to play. However, because this was a test of transfer, they were instructed only one time to use their strategies and were not reminded how to use their strategies. Those in the control groups were encouraged to 'do their best' at the same point that experimental participants were reminded to use their strategies for each task.

Procedures

Appendix V provides the original approval by the University of Florida Institutional Review Board for the procedures used in this experiment. Upon arrival to an isolated testing room located in the Florida Gymnasium, subjects (a) read a general description of the study and

signed the informed consent form, and (b) completed the form on demographic data (see Figure 1 for a general flowchart of the study). They were informed that the experiment occurred on 2 separate days and that attendance was necessary for both sessions. They were tested individually on Day 1 (acquisition and retention tests) and in a group setting on Day 2 (modified play). Those of similar skill level were tested in the same time frame for the first visit as the second visit involved the participation of these same subjects as a group. The purpose of this was to allow an adequate number of participants from each strategy group and skill level to attend Day 1 so as to avoid possible overlap of skill level or extended delays when it came time to test them on Day 2.

While in the testing room, participants (a) viewed a videotape of the diagonal lob serve and rally skill tests (Appendix W provides the narration for the racquetball skill tests videotape), (b) received their strategy treatments (in a taped and written format) if assigned to an experimental group and completed a short quiz for comprehension assessment, and (c) received general information on racquetball (in a taped and written format) if assigned to a control group and completed a short quiz for comprehension assessment. Once these procedures were completed, they proceeded to the three-wall racquetball courts. At the courts the experimenter checked each subject's racquet to

ISOLATED TESTING ROOM: DAY 1**THREE-WALL RACQUETBALL COURTS**

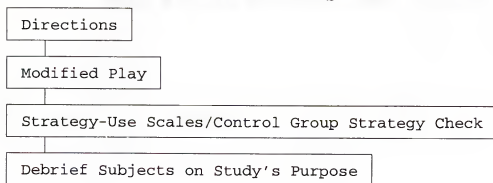
 1 Week Time Delay
DAY 2**MEET AT THREE-WALL RACQUETBALL COURTS**

Figure 1. General flowchart of the study.

see if it conformed to the specifications established by the investigator (i.e., mid-sized or over-sized racquets). Defective or traditionally small sized racquets were replaced. The experimenter had additional racquets available for use when necessary. Once the racquets were checked, the experimenter administered (a) the rally screening check, (b) the diagonal lob serve skill test followed by the rally skill test, and (c) the diagonal lob serve retention test followed by the rally retention test.

Screening Subjects

Prior to performing the two racquetball skill tests and the two retention tests, all players were screened for skill level by performing two 30 s rally trials. This test was based on the short wall volley test as cited by Hensley, East, and Stillwell (1979). The reliability of this test ranges from .76 to .86 while the validity is .79. The experimenter explained to all participants the purpose of performing this test and allowed them a 6 min period for warmup. A demonstration of the task by the experimenter was unnecessary as players had previously viewed a videotape of the rally skill test.

The following description is basically the same as those steps previously described for the rally skill test. Subjects must initially position themselves behind the short line and must not cross the short line during the testing period. Each player dropped a ball and hit it to the front

wall. The ball could be struck in midair or after any number of bounces once it had hit the front wall. If the ball failed to return in the vicinity of the short line, subjects moved to the front of the court to retrieve the ball, but were to return behind the short line to play the ball once again. If they completely missed the ball, the experimenter gave them another ball to put into play. Again, the subject must put the ball in play from behind the short line. Each rally was 30 s in duration. Following a short break, participants performed the second 30 s trial.

The legal hits were added together for the two 30 s trials. Beginning players were defined as those persons scoring between 14 and 33 legal hits. Advanced players were defined as those individuals scoring between 34 and 48 legal hits. Those individuals with a score higher than 48 were eliminated from the study.

Diagonal Lob Serve Skill Test

The diagonal lob serve skill test was administered once players were screened for skill level. They were initially provided with general instructions explaining the diagonal lob serve skill test as well as the basic performance steps of the diagonal lob serve. Experimental subjects were provided with a total of 2 practice trials for the diagonal lob serve while using their strategies (i.e., 1 trial for the frontside and 1 trial for the backside). When serving to the frontside, right-handed players were instructed to

stand in the left half of the service zone and serve to the back right skill box. When serving to the backside, right-handed players were instructed to stand in the right half of the service zone and serve to the back left skill box. The opposite was true for left-handed players. Participants in control groups had the same number of practice trials in a 'do your best' situation. The experimenter instructed players to remain in the service zone while serving the racquetball. During practice trials, if they were unable to successfully perform this serve on their own, the experimenter provided them with the basic performance steps once again to assist them in executing the serve.

Upon completion of the practice trials, participants proceeded to complete 10 trial blocks of 15 trials for a total of 150 trials. Half of the subjects from all groups ($\underline{n} = 40$) completed 5 trial blocks to the frontside followed by 5 trial blocks to the backside. The other half ($\underline{n} = 40$) completed 5 trial blocks to the backside followed by 5 trial blocks to the frontside.

Those in experimental groups were verbally reminded to use their respective strategies (i.e., self-directed, task-oriented, combined self-directed and task-oriented) over the course of the diagonal lob serve skill test. These reminders occurred prior to trial block 1; following trial blocks 2, 4, 6, 7, and 9; and after the fifth and tenth trials in each trial block. Those in control groups were

merely told to 'do their best' at the same point. Players were not provided with their scores.

As a strategy check and for strategy reinforcement, strategy-use scales were completed after the first, third, fifth, and eighth trial blocks for the diagonal lob serve skill test. Those in control groups received the general racquetball scale, following corresponding trial blocks, regarding questions about racquetball performance.

Rally Skill Test

Following the diagonal lob serve skill test, participants performed the rally skill test. They were initially provided with general instructions explaining the procedures as well as the basic performance steps. Practice trials were unnecessary as all players had prior experience with the task during the screening process.

Each person executed 10 trial blocks of the rally skill test and each trial block consisted of a 30 s period of play in which the experimenter recorded the number of times the ball was legally hit by the player. At the start of trial block 1 and following trial blocks 2, 4, 6, 7, and 9, subjects in experimental groups were verbally reminded to use their respective strategies while those in control groups were told to perform to the best of their ability. Strategy-use scales were administered to experimental subjects upon conclusion of the first, third, fifth, and eighth trial blocks to ensure that the respective strategies

were executed. Similarly, the general racquetball scale was administered to control subjects following the corresponding 30 s trial blocks. Participants were not given knowledge of results.

Diagonal Lob Serve Retention Test

Following the rally skill test, players were instructed to perform two trial blocks of 15 trials each of the diagonal lob serve. Half of all participants ($n = 40$) were directed to initially serve to their frontside while the other half began with their backside. Those in experimental groups were not reminded to use their strategies. Likewise, those in control groups were not encouraged to 'do their best'.

Rally Retention Test

Following the diagonal lob serve retention test, subjects were instructed to perform two 30 s trial blocks of the rally skill test. As in the diagonal lob serve retention test, players in experimental groups were not reminded to use their strategies. Likewise, those in control groups were not encouraged to 'do their best'.

Upon conclusion of the rally retention test, persons assigned to experimental groups were instructed to complete a strategy-use scale for the diagonal lob serve retention test and rally retention test. The purpose of completing this strategy-use scale was to determine whether they used their strategies during the retention tests. Control

subjects once again completed the general racquetball scale. All participators were then informed that the experimenter would contact them in the near future to return to the three-wall racquetball courts for completion of the second visit (i.e., modified play).

Modified Play

Approximately 1 week later ($M = 6.6$ days), participants reported directly to the three-wall racquetball courts where they were provided with general instructions on the rules of play. Two-wall serves were not allowed in the modified play situation as the server typically has a greater advantage over the opponent. Moreover, each serve resulted in 1 point given to the server or receiver (this is in contrast with standard racquetball rules). Players were also instructed to earn as many points as possible regardless of the game score.

Once these instructions were completely understood, each individual was reminded one time to use the strategies previously acquired during the modified play; however, they were not reminded how to use these strategies. The purpose of the modified play situation was to determine how well strategies transferred to a new racquetball task and to allow players in the four different strategy treatment conditions to compete against each other. To avoid a possible order effect, subjects were randomly assigned to their order of play. Random assignment occurred within

skill level and between strategy groups.

Upon completion of the testing sessions, strategy-use scales were administered to those in experimental groups at the end of the modified play situation to determine whether strategies were used during performance. Likewise, those in control groups completed the general racquetball scale and completed a short form (see Appendix X) questioning the possible use of any strategies that may have been executed over the course of the study. All participants were debriefed as to the purpose of the study.

Design and Analysis

The research design for this investigation was a randomized groups design. The independent variables were groups, skill, and trial blocks. Four group conditions were assigned: (a) self-directed, (b) task-oriented, (c) self-directed and task-oriented combined, and (d) no strategy. The two skill levels consisted of beginners versus advanced racquetball players. Data were analyzed in various trial block combinations (also referred to as application for the strategy-use scales).

The dependent measures were: (1) two separate skill test scores, (2) the total points scored in a modified play situation, (3) won/loss records for players in the modified play situation, and (4) scores for the strategy-use scales.

For the acquisition phases, a 2 X 4 X 10 (Skill X Group X Trial Block) analysis of variance (ANOVA) with repeated

measures on the last factor was calculated separately for each dependent measure obtained on the diagonal lob serve skill test and the rally skill test. Regarding the retention phase, a $2 \times 4 \times 2$ (Skill X Group X Trial Block) ANOVA was performed for the rally skill test. To determine whether significant differences occurred between the last two acquisition trial blocks and the retention trial blocks, a $2 \times 4 \times 4$ (Skill X Group X Trial Block) ANOVA with repeated measures on the last factor was computed separately for each skill test. For the transfer phase, a 2×4 (Skill X Group) ANOVA was performed for the dependent measures obtained during the modified play situation (total points and won/loss records). Furthermore, a 2×2 (Attention X Self-Monitoring) ANOVA was calculated for both dependent measures to determine if there was an interaction between the four groups used in this investigation.

Finally, $2 \times 4 \times 4$ (Skill X Group X Application) ANOVAs with repeated measures on the last factor were computed for the strategy-use scales administered throughout the diagonal lob serve and rally skill tests during the acquisition phase. Additionally, $2 \times 4 \times 2$ (Skill X Group X Application) ANOVAs were calculated to determine differences between strategy-use scales administered during the acquisition and retention phases. A series of 2×2 (Attention X Self-Monitoring) ANOVAs was also calculated for these strategy-use scales to identify the presence or

absence of any interaction between the four groups. Finally, a 2 X 4 (Skill X Group) ANOVA was performed for the strategy-use scale given to players upon conclusion of the transfer phase (modified play situation). A 2 X 2 (Attention X Self-Monitoring) ANOVA was also computed to determine any interaction among the four groups.

The predetermined alpha level was set at $p < .05$ for all statistical analyses. For each ANOVA computed, Tukey's honestly significant difference test was used as a multiple comparison procedure to identify any further significant differences, as appropriate. For significant interactions, a simple test of main effects was used to locate potential differences.

CHAPTER 4

RESULTS

Skill test scores for the diagonal lob serve and rally skill tests were analyzed with three-way ANOVAs for each skill level and strategy condition. Separate analyses were calculated for the acquisition and retention phases of the study. Total points scored in the modified play situation (transfer phase) and the won/loss records for players were analyzed by two-way ANOVAs. Scores for the strategy-use scales were analyzed with two-way and three-way ANOVAs.

The results generated by analysis of the dependent variables for this study will be presented in the following sequence: (a) diagonal lob serve, (b) rally skill test, (c) modified play, (d) strategy-use scales, and (e) questionnaire on the use of strategies by control groups. The traditional F tests were computed with conservative degrees of freedom adjustments (Greenhouse & Geisser, 1959). Epsilon values of 0.82 or greater were derived and it was determined that no violations were made relative to sphericity. When appropriate, Tukey's honestly significant difference (HSD) procedure was used for all follow-up mean comparisons. Tests for simple main effects were used to analyze significant interactions.

Skill Measures

Diagonal Lob Serve

Acquisition phase. The acquisition phase (trial blocks 1-5 for backside and frontside serves) was analyzed with a Skill X Group X Trial Block (2 X 4 X 10) ANOVA with repeated measures on the last factor.

The analysis indicated two significant main effects:

(a) Skill, $F(1, 72) = 20.68$, $p < .05$, and (b) Trial Block, $F(9, 720) = 23.26$, $p < .05$. As expected, advanced racquetball players ($M = 2.30$ points, $SD = 0.97$) performed significantly better than beginning players ($M = 1.68$ points, $SD = 0.80$) on the diagonal lob serve. Follow-up tests indicated that performance on the backside serve for trial block 1 ($M = 1.49$ points, $SD = 0.93$) was significantly lower than trial blocks 2, 3, 4, and 5. Likewise, performance on the frontside serve was significantly lower on trial block 1 ($M = 1.67$ points, $SD = 0.87$) when compared to trial blocks 2, 3, 4, and 5.

Analyses also revealed a significant Skill X Trial Block interaction, $F(9, 720) = 44.81$, $p < .05$. Figure 2 depicts the mean diagonal lob serve (backside) scores for both levels of skill across the acquisition and retention trial blocks. Figure 3 illustrates comparable information for the frontside serve. A simple main effect follow-up test revealed that advanced racquetball players were found to have significantly higher scores for the diagonal lob

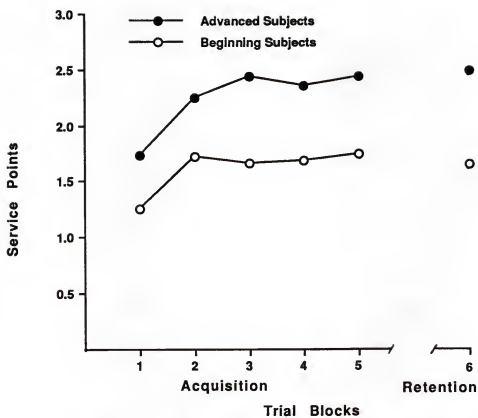


Figure 2. Mean diagonal lob serve (backside) scores for both levels of skill across acquisition and retention trial blocks.

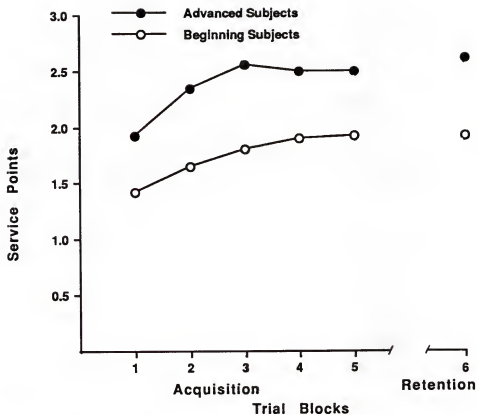


Figure 3. Mean diagonal lob serve (frontside) scores for both levels of skill across acquisition and retention trial blocks.

serves on each trial block when compared to beginning players.

When examining performance changes within each skill, higher skilled racquetball players made significant improvements on executing the backside serve as indicated by a comparison of trial block 1 ($\bar{M}$ = 1.73 points, SD = 0.95) to trial blocks 2, 3, 4, and 5. When serving to the frontside, advanced players significantly improved their serving ability based on comparisons of trial block 1 ($\bar{M}$ = 1.93 points, SD = 0.90) and trial blocks 3, 4, and 5.

Similar results were found upon examining performance changes for beginning players over time. Serving ability to the backside of the court on trial block 1 ($\bar{M}$ = 1.25 points, SD = 0.84) was significantly lower when compared to trial blocks 2, 3, 4, and 5. Performance to the frontside of the court was found to be significantly lower on trial block 1 ($\bar{M}$ = 1.42 points, SD = 0.77) when compared to trial blocks 3, 4, and 5.

Further analyses failed to reveal a significant main effect for Group, $F(3, 72) = 0.65$, $p > .05$ or a significant interaction for Skill X Group, $F(3, 72) = 1.39$, $p > .05$. Yet, two significant interactions were found for Group X Trial Block, $F(27, 720) = 14.60$, $p < .05$, and Skill X Group X Trial Block, $F(27, 720) = 16.30$, $p < .05$. Figure 4 illustrates the Group X Trial Block interaction for the backside serves. Figure 5 depicts the same information for

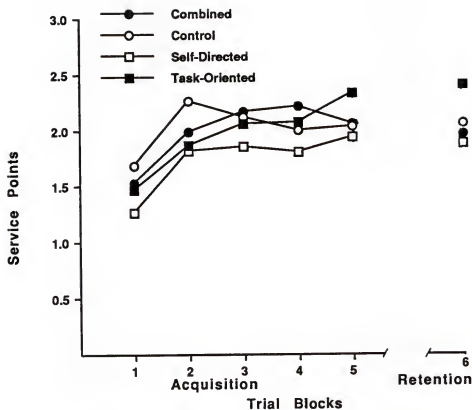


Figure 4. Mean diagonal lob serve (backside) scores for the four groups across acquisition and retention trial blocks.

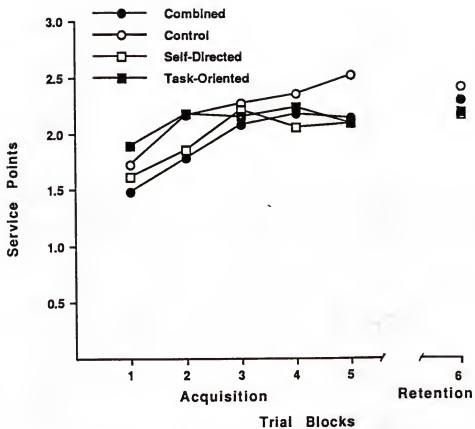


Figure 5. Mean diagonal lob serve (frontside) scores for the four groups across acquisition and retention trial blocks.

the frontside serves. Although both the two-way and three-way interactions were found to be significant, the results were not meaningful to this investigation as the significant differences either lay between skill level or across trial blocks. A simple main effect test as a follow-up, revealed no meaningful differences within skill level or trial block.

Acquisition/retention phases compared. Both phases were compared by computing a $2 \times 4 \times 4$ (Skill X Group X Trial Block) ANOVA with repeated measures on the last factor. The analysis encompassed trial blocks 5 (acquisition) and 6 (retention) for both the backside and frontside serves.

Analyses revealed a significant main effect for Skill, $F(1, 72) = 26.05$, $p < .05$. As expected, advanced racquetball players ($M = 2.51$ points, $SD = 0.92$) performed significantly better than beginning players ($M = 1.81$ points, $SD = 0.79$).

Significance was also found for Skill X Trial Block, $F(3, 288) = 30.55$, $p < .05$. A simple main effect follow-up test indicated that more highly skilled players achieved significantly higher scores when compared to beginning players for the last acquisition trial block (trial block 5) of the backside and frontside serves and the retention trial block (trial block 6) for both backside and frontside serves.

No significant main effects were found for either Group, $F(3, 72) = 0.72$, $p > .05$, or Trial Block, $F(3, 288) =$

2.03, $p > .05$. Additionally, no significant interaction was revealed for Skill X Group, $F(3, 72) = 2.46$, $p > .05$.

Significant interactions were generated for the following: (a) Group X Trial Block, $F(9, 288) = 4.15$, $p < .05$, and (b) Skill X Group X Trial Block, $F(9, 288) = 16.67$, $p < .05$. For the same reasons, as previously noted, these results were not meaningful to this investigation.

Rally Skill Test

Acquisition phase. The acquisition phase (trial blocks 1-10) was analyzed with a Skill X Group X Trial Block (2 X 4 X 10) ANOVA with repeated measures on the last factor.

Statistical analyses revealed significant main effects for Skill, $F(1, 72) = 61.32$, $p < .05$, and Trial Block, $F(9, 720) = 17.44$, $p < .05$. As expected, advanced racquetball players ($M = 20.08$ points, $SD = 3.60$) performed significantly better than beginning players ($M = 15.19$ points, $SD = 4.11$). Follow-up tests indicated that performance on trial block 1 ($M = 15.78$ points, $SD = 4.85$) was significantly lower than trial blocks 3 and 5-10. Additionally, trial block 2 ($M = 17.00$ points, $SD = 4.49$) was found to be significantly lower than trial block 10 ($M = 18.93$ points, $SD = 4.69$).

Analyses revealed a significant Skill X Trial Block interaction, $F(9, 720) = 69.29$, $p < .05$. Figure 6 depicts the mean performances for both levels of skill across the acquisition and retention trial blocks. A simple main

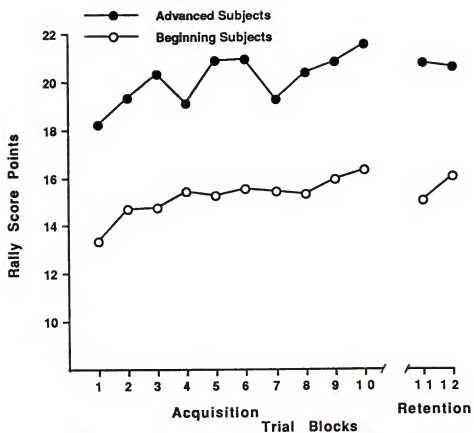


Figure 6. Mean rally skill test scores for both levels of skill across acquisition and retention trial blocks.

effect test indicated that more highly skilled racquetball players performed better than beginning level players for each trial block.

An examination of the advanced level players revealed that performance on trial block 1 ($\bar{M}$ = 18.20 points, SD = 3.70) was significantly lower than trial blocks 3, 5, 6, 8, 9, and 10. Performance on trial block 2 ($\bar{M}$ = 19.30 points, SD = 3.26) was found to be significantly lower when compared to trial blocks 5, 6, 9, and 10. Rally performance was also found to be significantly lower on trial block 4 ($\bar{M}$ = 19.08 points, SD = 4.36) as compared to trial blocks 5, 6, 9, and 10. Furthermore, significant trial block differences were found between trial block 7 ($\bar{M}$ = 19.28 points, SD = 3.45) and trial blocks 9 ($\bar{M}$ = 20.83 points, SD = 2.34) and 10 ($\bar{M}$ = 21.53 points, SD = 4.09). Beginning racquetball players scored a significantly lower number of rallies on trial block 1 ($\bar{M}$ = 13.35 points, SD = 4.68) compared to trial blocks 4, 6, 8, 9, and 10.

Analyses failed to indicate a significant main effect for Group, $F(3, 72) = 0.71$, $p > .05$, or a significant interaction for Skill X Group, $F(3, 72) = 0.65$, $p > .05$. Yet, significant interactions were found for the following: (a) Group X Trial Block, $F(27, 720) = 11.00$, $p < .05$, and (b) Skill X Group X Trial Block, $F(27, 720) = 58.04$, $p < .05$. Figure 7 illustrates the Group X Trial Block interaction. As found with the diagonal lob serves, the results for both

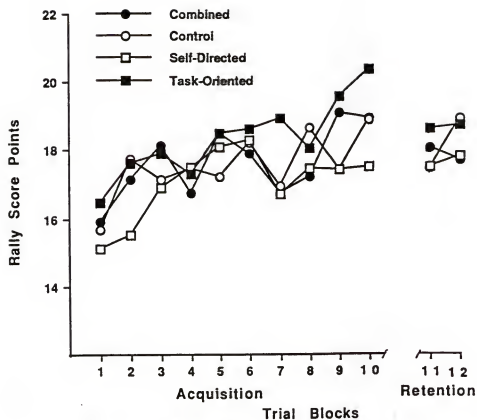


Figure 7. Mean rally skill test scores for the four groups across acquisition and retention trial blocks.

significant interactions were not meaningful for this investigation.

Retention phase. The retention phase (trial blocks 11 and 12) was analyzed with a 2 X 4 X 2 (Skill X Group X Trial Block) ANOVA with repeated measures on the last factor.

Statistical analyses indicated a significant main effect for Skill, $F(1, 72) = 42.73$, $p < .05$. As expected, advanced racquetball players ($M = 20.69$ points, $SD = 3.89$) performed significantly better than beginning players ($M = 15.52$ points, $SD = 4.10$).

Analyses also divulged a significant interaction for Skill X Trial Block, $F(1, 144) = 37.02$, $p < .05$. Advanced players were found to have scored significantly higher than beginners on trial blocks 11 and 12.

Further analyses failed to produce significant main effects for either Group, $F(3, 72) = 0.32$, $p > .05$, or Trial Block, $F(1, 144) = 0.28$, $p > .05$. Furthermore, no significant interactions were found for either Skill X Group, $F(3, 72) = 0.39$, $p > .05$, or Group X Trial Block, $F(3, 144) = 0.82$, $p > .05$.

Significance was discovered for the Skill X Group X Trial Block interaction, $F(3, 144) = 19.94$, $p < .05$. Again, this finding was not meaningful to this investigation.

Acquisition/retention phases compared. A 2 X 4 X 4 (Skill X Group X Trial Block) ANOVA with repeated measures on the last factor was performed to compare both the

acquisition (trial blocks 9 and 10) and retention (trial blocks 11 and 12) phases of the rally test.

Statistical analyses indicated a significant main effect for Skill, $F(1, 72) = 59.06$, $p < .05$. As previously shown, advanced racquetball players ($M = 20.94$ points, $SD = 3.55$) performed significantly better than beginning players ($M = 15.82$ points, $SD = 3.98$).

A significant interaction was found for Skill X Trial Block, $F(3, 288) = 45.90$, $p < .05$. A simple main effect follow-up test revealed that advanced players scored significantly higher than beginners for all four trial blocks.

Analyses failed to reveal significant main effects for either Group, $F(3, 72) = 1.21$, $p > .05$, or Trial Block, $F(3, 288) = 1.75$, $p > .05$. Moreover, no significant interaction was discovered for Skill X Group, $F(3, 72) = 1.12$, $p > .05$. Yet, significant interactions were indicated for Group X Trial Block, $F(9, 288) = 6.19$, $p < .05$, and Skill X Group X Trial Block, $F(9, 288) = 34.22$, $p < .05$. Again, these findings were not of interest for this investigation.

Modified Play (Transfer Phase)

Total points scored. Total points obtained by each player in the modified play situation were analyzed with a 2 X 4 (Skill X Group) ANOVA. A significant main effect (see Figure 8) was obtained for Group, $F(3, 65) = 2.66$, $p < .05$. Statistical analyses indicated that the task-oriented group

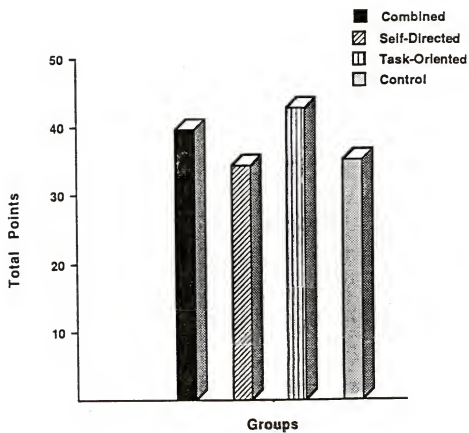


Figure 8. Mean total points acquired for the four treatment conditions during modified play.

($\bar{M}$ = 42.75 points, $\underline{SD}$ = 9.98) scored significantly more points than the self-directed group ($\bar{M}$ = 34.42 points, $\underline{SD}$ = 10.03) or the control group ($\bar{M}$ = 35.25 points, $\underline{SD}$ = 10.57).

Because of the group main effect, a 2 X 2 (Attention X Self-Monitoring) ANOVA was initiated to determine if an interaction existed between each of these four groups. Statistical analyses revealed a significant main effect for Attention, $F(1, 69) = 7.57$, $p < .05$. When attention was administered as a treatment, performance was found to be significantly higher ($\bar{M}$ = 41.09 points, $\underline{SD}$ = 8.88) than when attention was not provided to players ($\bar{M}$ = 34.85 points, $\underline{SD}$ = 10.18). No significance was found for Attention X Self-Monitoring, $F(1, 69) = 0.26$, $p > .05$. Due to the absence of a significant interaction, the effects of both attention and self-monitoring were independent. Only, attention was found to be significantly effective as a treatment.

Won/loss records. The total games won by each player in the modified play situation was analyzed with a 2 X 4 (Skill X Group) ANOVA. A significant main effect (see Figure 9) was found for Group, $F(3, 65) = 2.83$, $p < .05$. Follow-up analyses revealed that the task-oriented group ($\bar{M}$ = 5.31 games, $\underline{SD}$ = 2.55) won significantly more games than the self-directed group ($\bar{M}$ = 3.63 games, $\underline{SD}$ = 2.06) or the control group ($\bar{M}$ = 3.40 games, $\underline{SD}$ = 1.67).

Similarly, a 2 X 2 (Attention X Self-Monitoring) ANOVA was computed to determine the possible existence of a group

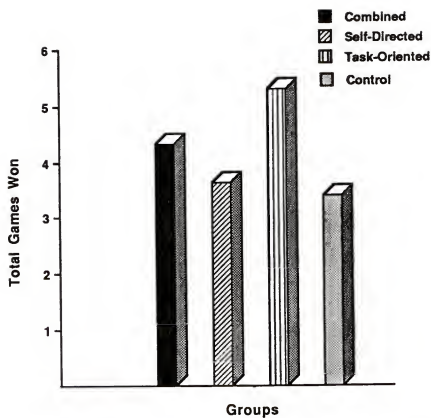


Figure 9. Mean total games won for the four treatment conditions during modified play.

interaction. Statistical analyses revealed a significant main effect for Attention, $F(1, 69) = 7.03$, $p < .05$. When attention was administered to players, performance was revealed to be significantly higher ($M = 4.79$ games, $SD = 2.28$) than when attention was not provided ($M = 3.51$ games, $SD = 1.85$). No significance was discovered for Attention X Self-Monitoring, $F(1, 69) = 1.57$, $p > .05$. Once again, the effects of both attention and self-monitoring were found to be independent with only attention as having a significant effect.

Strategy-Use Scales

Diagonal Lob Serve

Acquisition phase. The strategy-use scales for the acquisition phase (applications 1-4) of the diagonal lob serve were analyzed with a Skill X Group X Application ($2 \times 4 \times 4$) ANOVA with repeated measures on the last factor. Additionally, a 2×2 (Attention X Self-Monitoring) ANOVA was calculated to determine any potential group interaction.

Statistical analyses revealed significant main effects for Skill, $F(1, 72) = 9.04$, $p < .05$, and Group, $F(3, 72) = 4.71$, $p < .05$. Mean scores for advanced players ($M = 7.53$ points, $SD = 1.39$) were significantly higher than for beginning players ($M = 6.74$ points, $SD = 1.46$). Mean scores for both the combined ($M = 7.49$ points, $SD = 1.31$) and self-directed ($M = 7.62$ points, $SD = 1.15$) groups were significantly higher than the control group ($M = 6.36$

points, $SD = 1.50$).

Analyses also indicated significant interactions for Skill X Application, $F(3, 288) = 31.43$, $p < .05$, and Group X Application, $F(9, 288) = 32.31$, $p < .05$. A simple main effect test for Skill X Application revealed that the more highly skilled players scored significantly better on applications 1-4, when compared to beginners. Table 1 depicts the means and standard deviations for beginning and advanced subjects during the acquisition and retention phases of the diagonal lob serves and rallies as well as for the modified play situation.

With respect to the Group X Application interaction, a simple main effect test indicated that significant differences existed between groups within each application. Table 2 provides the means and standard deviations for each group during the acquisition and retention phases of the diagonal lob serve and rally skill tests, in addition to the modified play situation. The control group scored significantly lower than the self-directed and combined groups on all four applications. Additionally, the control group scored significantly lower than the task-oriented group on application 4.

Statistical analyses failed to reveal a significant interaction for Skill X Group, $F(3, 72) = 0.96$, $p > .05$. However, significance was found for the main effect of Application, $F(3, 288) = 18.71$, $p < .05$, and the interaction

Table 1

Means and Standard Deviations for the Strategy-Use Scales on Both Levels of Skill for the Acquisition, Retention, and Transfer Phases of the Study.

Source	Applications										M. Play*
	Diagonal Lob Serve					Rally					
	1	2	3	4	5	1	2	3	4	5	
Skill	1	2	3	4	5	1	2	3	4	5	1
ADV*	6.91	7.58	7.87	7.76	8.13	6.62	7.45	7.73	7.78	8.02	7.92
	1.45	1.29	1.53	1.28	1.08	1.56	1.33	1.30	1.28	1.24	1.05
BEG*	6.02	6.80	7.12	7.02	7.48	5.79	6.70	7.30	7.43	7.33	7.45
	1.42	1.52	1.38	1.50	1.26	1.52	1.33	1.49	1.49	1.34	1.09

Note. M. Play* indicates modified play.
 ADV* indicates advanced players.
 BEG* indicates beginning players.

Table 2

Means and Standard Deviations from the Strategy-Use Scales for Treatment Groups During the Acquisition, Retention, and Transfer Phases of the Study.

Source	Applications										M. Play*	
	Diagonal Lob Serve					Rally						
	1	2	3	4	5	1	2	3	4	5		
Groups	CB*	6.73	7.43	7.95	7.83	8.03	6.04	7.16	7.72	7.64	7.86	8.08
		1.47	1.14	1.34	1.28	1.10	1.36	1.12	1.03	1.34	1.15	1.04
	SD*	6.87	7.75	7.86	8.01	8.16	5.28	6.39	7.15	7.34	7.28	7.33
		1.32	1.10	1.28	0.91	0.86	1.79	1.58	1.39	1.21	1.45	1.10
	TO*	6.50	7.09	7.44	7.28	7.88	6.97	7.76	8.07	8.16	8.14	8.18
		1.55	1.64	1.63	1.58	1.39	1.34	1.26	1.38	1.29	1.32	1.26
	CT*	5.78	6.48	6.72	6.45	7.15	6.52	7.01	7.11	7.29	7.41	7.30
		1.50	1.63	1.47	1.41	1.24	1.40	1.24	1.63	1.63	1.31	0.69

Note. M. Play* indicates modified play.

CB* indicates combined group.

SD* indicates self-directed group.

TO* indicates task-oriented group.

CT* indicates control group.

of Skill X Group X Application, $F(9, 288) = 66.53$, $p < .05$. Neither Application nor Skill X Group X Application were meaningful for this experiment.

Due to the presence of a significant group main effect, a 2 X 2 (Attention X Self-Monitoring) ANOVA was performed. Analyses revealed a significant main effect for self-monitoring during Application 1, $F(1, 76) = 4.05$, $p < .05$, Application 2, $F(1, 76) = 6.60$, $p < .05$, Application 3, $F(1, 76) = 6.57$, $p < .05$, and Application 4, $F(1, 76) = 12.79$, $p < .05$. When self-monitoring was administered to players, strategy-use scores were revealed to be significantly higher ($M = 7.55$ points, $SD = 1.23$) than when it was not provided ($M = 6.72$ points, $SD = 1.55$). No significant interaction was found between attention and self-monitoring.

Acquisition/retention phases compared. Both phases (applications 4 and 5) were analyzed with a Skill X Group X Application (2 X 4 X 2) ANOVA with repeated measures on the last factor. A 2 X 2 (Attention X Self-Monitoring) ANOVA was also calculated to determine any possible interaction between groups.

Statistical analyses showed significant main effects for Skill, $F(1, 72) = 7.62$, $p < .05$, and Group, $F(3, 72) = 5.18$, $p < .05$. The advanced players ($M = 7.95$ points, $SD = 1.18$) scored significantly higher than beginning players ($M = 7.25$ points, $SD = 1.38$) during the retention phase. The control group ($M = 6.80$ points, $SD = 1.33$) scored

significantly lower than the combined ($\bar{M}$ = 7.93 points, SD = 1.19) and self-directed ($\bar{M}$ = 8.09 points, SD = 0.89) groups.

Significant interactions were found for both Skill X Application, $F(1, 144) = 14.41$, $p < .05$, and Group X Application, $F(3, 144) = 21.44$, $p < .05$. Regarding the Skill X Application interaction, a simple main effect test revealed that more highly skilled players scored significantly higher on application 5 (retention), when compared to beginners. Relative to the interaction for Group X Application, the control group was found to have scored significantly lower on application 5, when compared to the self-directed, combined, and task-oriented groups.

Analyses failed to reveal a significant interaction for Skill X Group, $F(3, 72) = 0.26$, $p > .05$. Significance was discovered for the main effect of Application, $F(1, 144) = 4.02$, $p < .05$, and the Skill X Group X Application interaction, $F(3, 144) = 23.98$, $p < .05$. However, these results were not meaningful for this experiment.

A 2 X 2 (Attention X Self-Monitoring) ANOVA was computed to examine the possibility of a significant interaction between the four groups. Statistical analyses revealed a significant main effect for self-monitoring: (a) Application 4, $F(1, 76) = 12.79$, $p < .05$, and (b) Application 5, $F(1, 76) = 4.95$, $p < .05$. When self-monitoring was administered to players, strategy-use scores were revealed to be significantly higher ($\bar{M}$ = 8.01 points, SD = 1.04) than

when it was not provided ($\bar{M} = 7.19$ points, $SD = 1.41$). No significant interaction was found between attention and self-monitoring.

Rally Skill Test

Acquisition phase. The strategy-use scales for the acquisition phase (applications 1-4) of the rally skill test were analyzed with a Skill X Group X Application ($2 \times 4 \times 4$) ANOVA with repeated measures on the last factor. The possible interaction of groups was analyzed with a 2×2 (Attention X Self-Monitoring) ANOVA.

Statistical analyses indicated significant main effects for Skill, $F(1, 72) = 4.86$, $p < .05$, and Group, $F(3, 72) = 3.44$, $p < .05$. The advanced players ($\bar{M} = 7.40$ points, $SD = 1.37$) scored significantly higher than beginning players ($\bar{M} = 6.81$ points, $SD = 1.46$). The self-directed group ($\bar{M} = 6.54$ points, $SD = 1.49$) scored significantly lower than the task-oriented group ($\bar{M} = 7.74$ points, $SD = 1.32$).

Significant interactions were found for Skill X Application, $F(3, 288) = 40.09$, $p < .05$, and Group X Application, $F(9, 288) = 34.07$, $p < .05$. For the Skill X Application interaction, the advanced players scored significantly higher than beginners for applications 1 and 2. Regarding the Group X Application interaction, the self-directed group scored significantly lower than the task-oriented group on application 1 and application 2 and the self-directed group scored significantly lower than the

control group on application 1. Additionally, the control group scored significantly lower than the task-oriented group on application 3.

No significance was revealed for Skill X Group, $F(3, 72) = 0.49$, $p > .05$. However, analyses indicated significance for the main effect of Application, $F(3, 288) = 35.64$, $p < .05$, and for the interaction of Skill X Group X Application, $F(9, 288) = 39.33$, $p < .05$. Neither Application nor Skill X Group X Application were considered meaningful for this investigation.

A 2 X 2 (Attention X Self-Monitoring) ANOVA was calculated due to an existing group main effect. Analyses revealed a significant main effect for self-monitoring on the following: (a) Application 1, $F(1, 76) = 10.67$, $p < .05$, and (b) Application 2, $F(1, 76) = 4.33$, $p < .05$. When self-monitoring was not administered to players, strategy-use scores were revealed to be significantly higher ($M = 7.07$ points, $SD = 1.31$) than when it was provided ($M = 6.22$ points, $SD = 1.46$). Statistical analyses also indicated a significant main effect for attention: (a) Application 2, $F(1, 76) = 6.70$, $p < .05$, and (b) Application 3, $F(1, 76) = 6.16$, $p < .05$. Strategy-use scores were revealed to be significantly higher for players receiving attention ($M = 7.68$ points, $SD = 1.20$) than when it was not administered ($M = 6.92$ points, $SD = 1.46$). No significant interaction was indicated between attention and self-monitoring.

Acquisition/retention phases compared. The strategy-use scales for the retention phase (applications 4 and 5) of the rally skill test were analyzed with a Skill X Group X Application (2 X 4 X 2) ANOVA with repeated measures on the last factor.

Analyses revealed a significant interaction for Skill X Application, $F(1, 144) = 5.72$, $p < .05$. A simple main effect test revealed that the more highly skilled players scored significantly better than beginners on application 5.

Analyses failed to reveal significance for the following: (a) Skill, $F(1, 72) = 3.42$, $p > .05$, (b) Group, $F(3, 72) = 1.95$, $p > .05$, (c) Application, $F(1, 144) = 0.08$, $p > .05$, and (d) Skill X Group, $F(3, 72) = 0.61$, $p > .05$. Yet, significance was found for Group X Application, $F(3, 144) = 4.11$, $p < .05$, and Skill X Group X Application, $F(3, 144) = 8.66$, $p < .05$. Again, the results of these two interactions were not meaningful for this experiment.

Modified Play

The strategy-use scales for the transfer phase of the study were analyzed with a Skill X Group (2 X 4) ANOVA. The analysis revealed a significant main effect for Group, $F(3, 65) = 3.45$, $p < .05$. Analyses indicated that both the control and self-directed groups scored significantly lower than either the combined or task-oriented groups.

A 2 X 2 (Attention X Self-Monitoring) ANOVA was computed to detect the presence of a group interaction.

Statistical analyses revealed a significant main effect for Attention, $F(1, 69) = 11.30$, $p < .05$. When attention was provided as a treatment, scores were determined to be significantly higher ($M = 8.13$ points, $SD = 1.13$) than when attention was not provided ($M = 7.31$ points, $SD = 0.90$). Attention X Self-Monitoring, $F(1, 69) = 0.06$, $p > .05$ was not found to be significant.

Strategy Follow-Up Questionnaire for Control Subjects Beginning Players

Three beginners reported that they did not use or develop any type of strategy or skill technique that was beneficial while participating in the study. However, two of these players did express the need for achievement by such statements as "I play to win" and "I desire to crush my opponent". Six beginners reported the use of strategies relative to the racquetball game (e.g., passing shots, hitting the ball low and hard, and fast serves). Only two players reported the use of strategies in the form of positive self-talk and focusing (i.e., aim away from opponents). Both of these players felt that the strategy was helpful to their performance and indicated that positive self-talk was used approximately 70% of the time while focusing was utilized about 13% of the time during the study.

Advanced Players

Three of the higher skilled players reported that they

did not use or develop any type of strategy or skill technique that was helpful to their performance. Three other players reported the use of game related strategies. Of those three players, one individual reported observing others to determine their own weaknesses; however, it was not felt that this was beneficial to overall performance. The remaining four players each reported the use of strategies in the form of imagery (used 70% of the time), self-monitoring (used 75% of the time), readying and imaging (used 75% of the time), and positive thoughts (used 10% of the time). All were thought to be beneficial to performance with the exception of positive thoughts.

CHAPTER 5

DISCUSSION, SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

This experiment was designed to test hypotheses related to self-directed and task-oriented strategies. The primary purpose of the study was to determine whether a self-directed strategy (self-monitoring), a task-oriented strategy (attentional focusing), or a combination of these strategies would be more beneficial to acquiring racquetball skill and to also examine these strategies' interaction with the participant's level of skill.

The most meaningful finding for the first testing session (diagonal lob serve and rally skill tests) was the significant Skill X Trial Block factor. This indicates that (a) subjects were classified correctly according to skill level, and (b) learning occurred over time for each group with different levels of skill. Unfortunately, no group differences were discovered during this testing occasion. However, significant group differences were obtained under the second testing condition in the modified play situation (transfer phase). Yet, these results for modified play suggest that only the task-oriented group (beginners and advanced players together) benefitted from their strategy.

This chapter is organized and will be presented in the following manner. Presented first will be a discussion section that will address several subheadings including the original hypotheses of this experiment and whether the data support these hypotheses, a discussion that compares this investigation's findings with previous research literature and theory on strategies, and other possible explanations for the findings in this study. This will be followed by a summary, conclusions, and possible ideas for future research.

Discussion

Original Hypotheses

The original hypotheses for beginning players were as follows: (a) the learning and performance of racquetball skills would be enhanced for those players receiving a combination of self-directed and task-oriented strategies when compared to those who received a task-oriented, self-directed, or no strategy, (b) players would attain greater achievement from a task-oriented strategy as compared to a self-directed or no strategy, and (c) achievement would be enhanced using a self-directed strategy as compared to a no strategy condition.

The original hypotheses for advanced players were as follows: (a) racquetball skills would be enhanced to a greater extent for those players receiving the combination of self-directed and task-oriented strategies than those who

received a self-directed, task-oriented, or no strategy, (b) a self-directed strategy group's learning and performance would exceed groups receiving task-oriented or no strategies, and (c) players would experience greater achievement from a task-oriented strategy when compared to a no strategy condition.

Within each skill level, it was hypothesized that players would benefit from a strategy when compared to a no strategy condition. This was evident for the task-oriented group, regardless of skill, during modified play. The task-oriented group performed significantly better than the control group (and self-directed group) on both dependent measures: total points scored and the won/loss records.

The major question to be answered centers around why the remaining hypotheses were not supported by the data. To answer this question, a comparison of the present investigation will be made to prior research and a review of the existing theory will be provided in order to yield further insight into the findings of this study.

Existing Experimental Research and Theory

Previous investigations. A review of other experiments in which the effects of strategies on performance were examined, clearly indicates that strategies tend to improve performance. This has been demonstrated in laboratory experiments utilizing various novel tasks (Ryan & Simons, 1982; Singer, Hagenbeck, & Gerson, 1981; Singer &

Suwanthada, 1986; Zecker, 1982) and in actual field experiments involving highly skilled or elite athletes (Fenker & Lambiotte, 1987; Houghton, 1991; Mace et al., 1986, 1987). Very few investigations (Weigand et al., 1992; Weinberg, Gould, Jackson, & Barnes, 1980) have reported the absence of performance enhancement when strategies were used.

Based on the literature, a series of questions may be posed concerning the findings of this study. For instance, why have several other field (real world) studies yielded significant improvements in performance when strategies were administered? In contrast, why were only a few beneficial effects noted in the present study?

Perhaps the answers to these two questions may be found in the methods used to teach individuals a particular strategy, the nature of the subjects selected, and the types of tests administered. The procedures used in several of the field studies involved teaching participants one or more strategies over the course of several sessions or weeks (Gray, 1990; Johnston-O'Connor & Kirschenbaum, 1986; Kirschenbaum et al., 1982; Meyers & Schleser, 1980; Noel, 1980; Weinberg et al., 1981).

The present study involved instructing racquetball players in the use of a strategy for a period of only 15 min during the first testing session. This observation would seem to indicate that they might not have been instructed

for a long enough period of time in strategy use. It may be conjectured that very different results could have occurred if the same study was conducted with several sessions of strategy instruction and practice. However, if strategy instruction was not adequate, then why did group differences occur in actual modified play approximately 1 week following instruction for strategy use?

Moreover, the vast majority of field investigations are centered around highly skilled and elite athletes, such as cross country skiers (Rushall et al., 1988), Olympic gymnasts (Mace et al., 1986, 1987), elite orienteers (Gal-Or et al., 1986), Olympic archers (Houghton, 1991), and basketball players (Meyers et al., 1982; Meyers & Schleser, 1980). Subjects for most of these investigations consisted of high level athletes who had experienced performance decrements related to stress, anxiety, and problems with concentration. These were athletes who were committed to performing well in a particular sport and seriously wished to acquire the necessary strategies needed to improve their overall performance.

In comparison, participants in the present study were volunteers from various higher education classes who had reasonable racquetball skills. The implication here is that they may not have had any serious interest in the learning and acquisition of strategies to enhance their racquetball performance. Skilled and unskilled players who are serious

about racquetball and who are committed to the sport would have been more desirable.

It is of interest to note that Weinberg et al. (1981) have reported improved performance for athletes engaging in visuo-motor behavior rehearsal (VMBR) during a karate competition. These results occurred following 6 weeks of instruction in the use of several strategies (VMBR, imagery, relaxation). The reason this finding is meaningful in the present context is that Weinberg et al. failed to find performance improvements for basic karate skill tests even after 6 weeks of instructions on three different strategies. This result is similar to the present study in that only attentional focusing resulted in enhanced racquetball performance during actual play while performance on basic racquetball skill tests was unaffected by any strategy.

Perhaps strategy use during basic skill tests is not perceived as of the same importance as compared to actual competitive settings involving high-level athletes. Moreover, the field studies previously cited indicated positive results for strategies when athletes used these strategies during training and competitive situations. If subjects actually view basic skill tests as unimportant or not meaningful, then the use of strategies will probably fail to yield any significant findings.

Existing theory. It was theorized that self-monitoring would be an effective strategy for both advanced and

beginning racquetball players as it should serve: (a) to increase one's level of self-efficacy, (b) as a process for self-regulation by way of error feedback, and (c) to benefit the setting and acquisition of goals.

Bandura (1977) has theorized that individuals typically try to perform with greater effort over a longer period of time as self-efficacy levels are increased. Self-monitoring, if used correctly, should have served to enhance self-efficacy regardless of skill level. Players should have attended to their achievements (i.e., self-accomplishments) and should have maintained positive outlooks in the event of performance error.

In general, if those groups using the self-monitoring strategy failed to self-monitor their mistakes constructively then performance decrements would most likely have been observed. Furthermore, if these groups attended to performance error in a negative fashion, then it was very unlikely that goal setting occurred. It is possible that if ample time to learn effective self-monitoring was not provided, then subjects may not have had the ability to constructively self-monitor performance. If they used the self-monitoring technique incorrectly, they may have potentially developed a greater self-awareness for performance error leading to reduced levels of self-efficacy and decrements in task execution.

The effectiveness of self-monitoring was also based, in part, on self-regulation models. Kirschenbaum (1985, 1987) has proposed five stages of self-regulation. Included within these stages was commitment on the part of the individual to modify behavioral problems and the ability to generalize constructive behavioral changes to future performance situations. Possibly, groups receiving self-monitoring were neither committed to identifying problems in skill execution nor committed to modifying performance error. This is potentially true for all three phases of this experiment.

Another possible reason for the failure of self-monitoring groups to exhibit improvements in performance centers around Carver and Scheier's (1981) closed-loop, negative feedback model of behavioral self-regulation. As previously discussed, they have proposed four functions and stated that disruptions may occur at any point within the model. To review, the functions included: (a) an input function, (b) a comparator, (c) an output function, and (d) behavioral impact.

Disruptions should not have occurred with the input function or comparator as all individuals using the self-monitoring technique were provided with a videotape of a highly skilled racquetball player performing the skills to be executed in the study. Additionally, these subjects received basic performance steps providing essential cues to

attend to when serving or rallying the ball. However, it is possible that the output function was disrupted. They may have been unable to self-monitor information derived from previously executed skills to change subsequent performances.

The second strategy used in this investigation was attentional focusing. Attentional focusing was based upon various models of selective attention. They include filter models (Deutsch & Deutsch, 1963), attenuation models (Treisman, 1969), and pertinence-based models (Norman, 1968). Selective attention is the ability of a person to attend to relevant cues in the environment while disregarding distractors.

Results from the modified play situation yielded evidence that the task-oriented group (those who used only attentional focusing) performed better than the self-directed and control groups. This would seem to indicate that both skill levels were able to disregard irrelevant information from the environment and were better able to anticipate the speed and direction of the ball as well as movements of the opponent. Similar observations should also have been apparent for the diagonal lob serves and rallies. Yet, if groups using attentional focusing were unable to focus on the appropriate aspects of either task, then improvements in performance would not have been expected.

Mahoney (1984), as mentioned in a previous chapter, has suggested five techniques for attention regulation in athletes. It was proposed that athletes should avoid thoughts of evaluation by a coach and attend to the current performance rather than the previous or future execution of a skill. The first testing session in this study (serves and rallies) involved the evaluation of participants on an individual basis. If groups using attentional focusing were unable to avoid thoughts of evaluation by the experimenter, then reductions in performance would be expected. When performing within a group setting (i.e., modified play), these individuals may have been better able to disregard the presence of the experimenter. Moreover, attentional focusing groups may not have effectively blocked thoughts of prior and forthcoming attempts when serving or rallying the ball. If they had a tendency to focus on performance error, then skill execution would have been decreased.

To briefly summarize, several field studies have exhibited positive results as a result of strategy use. The lack of group differences for the racquetball skill tests in the current investigation may have been due to one or more of the following: (a) the length of time participants were trained in the use of strategies, (b) the types of subjects used for the experiment, and (c) the types of tasks they were asked to perform. Additionally, subjects may not have acquired the skill to constructively self-monitor

performance and may not have been committed to identifying and modifying performance error. Regarding attentional focusing, significant performance enhancement may not have occurred if players: (a) were highly affected by the presence of the experimenter during the first visit, or (b) were unable to block distracting thoughts relative to prior or future skill execution.

There are many additional reasons that could possibly serve to explain the results of this study. The following section explores other potential causes that may justify the research findings. Possible explanations may lie within several areas: (a) the use of self-paced versus externally paced tasks and the strategies provided to subjects to perform these tasks, (b) the methods used for strategy instruction, (c) the possible distractors players encountered, (d) the strategy-use scales, and (e) the strategy follow-up questionnaires administered to control groups.

Other Possible Explanations for Results

Types of tasks and strategies. The kinds of tasks used in this investigation were both self-paced (diagonal lob serves) and externally paced tasks (rallies and modified play). Moreover, these tasks were performed in conjunction with strategies that were uniquely different from one another. As discussed in a previous chapter, most strategies have raised learning and performance levels when

the skill to be executed was self-paced. This is true because self-paced tasks allow the learner/performer ample time to contemplate the skill to be performed and to utilize a strategy. In contrast, externally paced skills require that the learner/performer undergo rapid decision making relative to task execution. Because the person must react in response to the environment, very little time exists to deliberately implement a particular strategy that is in the process of being acquired.

One partial explanation as to why differences among self-directed, combined, and control (no strategy) groups were absent throughout the study may lie with the strategy of self-monitoring. Singer, Cauraugh, Tennant, et al. (1991) have stated that self-directed strategies (e.g., self-evaluation, self-awareness) may potentially harm performance levels by making the learner/performer increasingly aware of his or her internal state. Self-monitoring may have ultimately served as a psychological diversion from effective task performance. In other words, players who are so attuned to their internal state may be distracted from the skill to be executed. If they were ultimately distracted from the skills to be performed, then performance decrements would have been evident regardless of whether the activity involved brief self-paced or extended playing.

A second possible reason as to why group differences were not found for combined, self-directed, and control groups during the rally skill test or the modified play situation may be due to the fact that both tasks were externally paced. As previously revealed, Carver and Scheier (1981) have indicated that as tasks become increasingly rapid, attention is directed away from the self and toward the environment. Therefore, self-directed strategy groups may have suffered a decrement in performance if aims were to have an internal focus. The same could be said for combined groups (self-monitoring and attentional focusing). When subjects were to engage in self-monitoring, then the act of self-monitoring could realistically have caused performance decrements. These suppositions are partially supported by the data collected from the combined groups. Approximately 66.67% of advanced players claimed to have used self-monitoring more than attentional focusing during the first test. Regarding beginners, 25% stated that self-monitoring was used more than attentional focusing while 37.5% claimed to have used both strategies equally.

Upon examination of the data, the general trend for the diagonal lob serves to the backside court indicates that the self-directed group performed more poorly than any other group. The data for serves to the frontside court reveals that, in general, the self-directed and combined groups experienced greater performance decrements than the task-

oriented and control groups. Perhaps, as suggested by Singer, Cauraugh, Tennant, et al. (1991), the self-directed and combined groups became too aware of their internal states when self-monitoring. Both strategies may have actually lead to performance decrements when executing serves.

The data for the rally skill test illustrates that the self-directed group performed less effectively than all other groups. Relative to the modified play, neither the self-directed nor combined groups exhibit improvement in playing performance. Perhaps, as previously suggested, both strategies were inappropriate as both tasks were externally paced. If advanced and beginning subjects in combined groups were self-monitoring to a greater extent, then perhaps performance failed to improve because an adequate amount of time was not available to deliberately use this strategy. Yet, they could potentially have used self-monitoring successfully (if used correctly) between rallies and between points in the modified play situation, when there was ample time to monitor feedback.

It could be argued that another possible reason for the general failure of the combined group during modified play was that this particular strategy provided players with too much to think about. Yet, this argument was proven false by the 2 X 2 (Attention X Self-Monitoring) ANOVA which was initiated for both the modified play situation and strategy-

use scales. Due to lack of a significant interaction between groups, failure of the combined strategy could not be attributed to the assumption that subjects had too much to consider when attempting to execute.

With respect to the attentional focusing strategy, significant group differences should have been observed for the diagonal lob serves and rallies. Attentional focusing may be used successfully for many types of tasks regardless of whether they are self-paced or externally paced. Focusing attention externally to the task should have permitted participants to disregard most types of distractors. Therefore, perhaps the actual location of the target used for the serves contributed to the failure of the attentional focusing strategy. Investigations, in which attentional focusing benefits have been found for performing skills, have included tasks that are located directly in front of subjects. Examples of such tasks include ball tossing (Singer et al., 1993), throwing darts and soccer foul shooting (Singer & Suwanthada, 1986), and modified table tennis (Singer, DeFrancesco, & Randall, 1989). In contrast, the target used in this study was positioned directly behind participants. Attention was initially directed to the diagonal lob serve line on the front wall rather than to the target where the ball was served.

For the rallies, the general trend indicates that the task-oriented group performed better overall than the self-

directed, combined, and control groups. Perhaps significant group differences failed to occur since each rally was a timed event. Several participants have stated that performance seemed to deteriorate from increased arousal levels due to the time factor. Nevertheless, attentional focusing should have resulted in significantly improved rallies for both levels of skill if used properly.

During the modified play situation, group differences were found between the task-oriented group and the self-directed and control groups. The general indication is that attending to the task rather than to the inner self was more beneficial in an actual play setting regardless of skill. This would follow the point Carver and Scheier (1981) made regarding the increased use of attention relative to the increased pace of a task.

Although significant group differences were found only when both levels of skill were analyzed as one group, the general trend of the data indicates that beginning and advanced players using attentional focusing during actual play performed better than those in self-directed, combined, or control groups. The fact that beginners in the task-oriented group performed better during modified play supports the stages of learning proposed by Fitts and Posner (1967). The cognitive stage (the first phase of learning) centers around what is to be executed and how the first trials should be attempted. This implies that learners in

the cognitive stage are very task-oriented. For this study, attentional focusing was shown to be more advantageous for beginners, possibly indicating that the main concern for these subjects centered around the task (i.e., 'what to do'). Furthermore, evidence that the advanced level players benefitted from the use of attentional focusing during modified play supports the findings of Abernethy (1988, 1990) and Abernethy and Russell (1987). They have concluded that higher skilled persons are more able to anticipate and attend to pertinent environmental cues as compared to lesser skilled individuals.

Strategy instruction. Another possible explanation for the general failure to observe differences among groups may be related to how strategies were taught. Subjects were instructed for approximately 15 min in the use of their respective strategies. This instruction included a taped and written version of the strategy to be used, a short practice period using the strategy of interest, and a short true-false quiz to determine whether they understood the strategy.

Approximately 98% of the participants passed this quiz with no problem. As Royer, Cisero, and Carlo (1993) have pointed out, however, "...procedures that measure only the extent to which learners have mastered the declarative knowledge essential for functioning in a domain have a serious limitation" (p. 211). True-false quizzes provide

insight as to whether or not subjects understand the essential information (i.e., strategy) to utilize for skill development; however, they may still be uncertain as to how to actually use the strategy while performing a task. A real possibility exists that individuals may not have adequately mastered their respective strategy even with a short practice session.

Distractors. Failure to observe numerous group differences may be because the diagonal lob serves and rallies were performed in an ecologically valid setting where there was no control over various types of visual and auditory distractors. Examples of these distractors include weather (i.e., cold, heat, wind, and rain), the ability to view other individuals in close proximity to or on the racquetball court, time of day, and a large variety of sounds (i.e., sirens, general traffic, and voices of other players and passers-by).

Although, the strategies in this study should have provided the means to disregard any distractors, perhaps the number and kinds of distractors were too great for the treatments to be productive. Laboratory situations may be controlled fairly effectively as to potential distractions. In an actual play setting, the experimenter has no control over the type, number, or degree of distractors to which subjects are exposed. Perhaps each strategy, especially attentional focusing, was not strong enough to counteract

the negative effects of distractors as they occur in real world test situations.

It is also postulated that the experimenter may have potentially served as an additional distractor during the first test. The possibility exists that the experimental groups' performance was reduced due to receiving numerous verbal strategy reminders and written strategy-use scales throughout the diagonal lob serve and rally skill tests. Obviously, the original intent of the verbal and written strategy reminders was to make each strategy as strong as possible for enhancement of learning and performance. Yet, it is possible that these reminders served as distractors in and of themselves. Frequently, participants remarked that verbal and written strategy reminders disrupted the flow of the task and once disrupted, it was hard to resume a certain level of performance.

Strategy-use scales. Further insight as to why so many nonsignificant results occurred may be derived from an examination of the strategy-use scales. For the diagonal lob serves, the major finding was that no scoring differences appeared between the combined, self-directed, or task-oriented groups. However, the combined and self-directed groups scored significantly higher than the control group for each scale administered during the acquisition and retention phases. Furthermore, the control group scored significantly lower than the task-oriented group during the

retention phase.

Strategy-use scales administered during the rally skill test did not yield consistent scoring differences between groups and failed to show any differences in scores between groups for the last acquisition and retention applications. The primary finding indicates that the self-directed group scored significantly lower than the task-oriented group (applications 1 and 2) and the control group (application 1).

With respect to strategy-use scales administered during the modified play, significantly higher scores were noted for the combined and task-oriented groups when compared to the self-directed and control groups. No other group differences were revealed.

Upon examination of the strategy-use scales for the diagonal lob serves, it would be anticipated that group differences on serving performance should have occurred between the control group and the combined and self-directed groups. As the combined and self-directed groups maintained higher scores on the strategy-use scales, it would have been expected that both groups would have scored higher than the control group for backside and frontside serves. As the 2 X 2 (Attention X Self-Monitoring) ANOVA revealed, strategy-use scores were higher when self-monitoring was provided than when it was absent. This finding indicates that participants were self-monitoring diagonal lob serving

performance. Yet, as suggested earlier, if self-monitoring reduces performance by causing subjects to become too aware of their internal states, this could partially explain the lack of group differences for this skill test.

When inspecting the strategy-use scale results for the rally skill test, it is apparent that very few group differences occurred. Furthermore, these differences were not consistent between applications. Statistical analyses did yield evidence that strategy-use scores were higher when attention was provided as a treatment. Apparently, the effects of attention were not strong enough to create group differences when rallying over time.

Relative to the strategy-use scales administered during the modified play situation, the scores for the task-oriented group did predict that these individuals would perform better than either the self-directed or control groups. Analyses did provide evidence that scores were higher when attention was administered as a treatment. Yet, according to the scores for strategy-use scales administered to combined groups, it was expected that this group would have performed significantly better in the modified play situation than either the self-directed or control groups.

Therefore, in summary, the scores for strategy-use scales administered to each group only partially predicted how each group would perform for the rally skill test and modified play. Strategy-use scales virtually failed to

predict how each group would perform for the diagonal lob serve skill test.

Strategy follow-up questionnaire. Further partial explanations for the results of this investigation may be found in the use of other strategies by control groups throughout the course of the study. Questionnaires were given to each participant assigned to a control group at the conclusion of the study to determine whether or not strategies were utilized.

The results of this questionnaire for beginners indicates that only 20% of control subjects reported the utilization of some type of strategy. Of these participants, only 10% identified the use of attentional focusing. Self-monitoring was not indicated as having been a viable strategy during the study.

With respect to advanced players, 40% reported that strategies were employed. Only 10% indicated the use of self-monitoring. Attentional focusing was apparently not incorporated during either testing session.

Potentially, these strategies may have been strong enough to counteract any possible differences among the four groups. Although the number of subjects was small, it is interesting to note that beginning control players reported the use of attentional focusing while advanced control players reported the use of self-monitoring. This would seem to support the work of Fitts and Posner (1967) in which

they have stated that beginners are more concerned with the task while more highly skilled individuals are more involved in decision-making activities.

Summary

The purpose of this investigation was to determine whether a self-directed strategy, a task-oriented strategy, or a combination of both types of strategies was more beneficial for beginning and advanced racquetball players performing basic skills and in actual play. The self-directed and task-oriented strategies consisted of self-monitoring and attentional focusing, respectively.

Participants were met on two occasions. On the first one, they (a) read and signed an informed consent form, (b) completed a demographic data sheet, (c) viewed a videotape of the racquetball skill tests to be executed that same day, (d) listened to a tape and read a typed version of the tape which instructed them in strategy use, and (e) performed a short quiz to determine understanding of the strategy. Training in strategy use lasted approximately 15 min for each group.

Following this training session, the experimenter accompanied participants on an individual basis to the three-wall racquetball courts where they were allowed a period of 6 min to warm-up and practice the acquired strategy. Once the warm-up period concluded, the experimenter requested the subject to perform a rally

screening check to assist in the determination of skill level. This required that players rally the ball for two 30 s trials. They were excused from the study if they did not meet certain specifications.

Once chosen for the study, players were administered general instructions and basic performance steps to read prior to performing the diagonal lob serves and rallies (acquisition phase). Everyone was required to execute 75 serves to the backside of the court and 75 serves to the frontside of the court for a total of 150 serves. They were then requested to rally the ball for ten 30 s trials and were verbally reminded by the experimenter throughout both skill tests to use their respective strategies. Strategy-use questionnaires were completed following trial blocks 1, 3, 5, and 8 for both the serves and rallies. These questionnaires served as a strategy check to ensure that their respective strategies were used. Upon conclusion of the acquisition phase, 15 additional serves were performed to both the backside and frontside of the court for a total of 30 serves. Players then rallied the ball for two additional 30 s trials. Once again, strategy-use questionnaires were completed as a measure of strategy retention.

Approximately 1 week later, subjects participated in a modified play situation (transfer phase). Those from the same level of skill representing the four strategy

conditions played a total of nine games. At the conclusion of the study, a strategy-use questionnaire was completed. Furthermore, control subjects filled out an additional survey to determine potential strategies they may have used during the study.

ANOVAs were computed on the various dependent measures for the two skill tests, the modified play situation, and the strategy-use scales. The results for both skill tests indicated that advanced players performed better than beginning players across trial blocks. Regarding the modified play situation, the task-oriented group performed better than the self-directed and control groups for both total points scored and total games won. Relative to the strategy-use scales, advanced players were found to have scored significantly higher than beginners over time. Additionally, the results indicated that the combined and self-directed groups scored higher than the control group for the serves, while the combined and task-oriented groups scored higher than the self-directed and control groups for the modified play situation. With respect to the rallies, group differences were apparent; however, they were not consistent over time.

Conclusions

Based on the results of this research, the following conclusions seem to be warranted:

1. More highly skilled players perform basic racquetball skills better when compared to beginners.
2. Learning occurs for beginning and advanced players over time when performing basic racquetball skill tests.
3. Neither self-monitoring, attentional focusing, nor a combination of these strategies is beneficial to the performance of basic racquetball skills when compared to the control condition.
4. Attentional focusing appears to be a more beneficial strategy during actual play (i.e., modified play) when compared to self-monitoring and control conditions, regardless of skill level.
5. Neither self-monitoring nor a combination of self-monitoring and attentional focusing is more advantageous during actual play relative to the control condition.
6. Attentional focusing, as a treatment, is more advantageous for subjects during actual play than when attentional focusing is not provided.
7. According to the classification scheme proposed by Singer and Chen (1993, 1994), the results of this study may be interpreted as meaning task-oriented strategies are more advantageous during actual play than self-directed strategies or the two strategy types combined.
8. More highly skilled players appear to use strategies more frequently than beginners during the diagonal lob serves and rallies (acquisition phase only).

9. Groups appear to use strategies differently depending upon the task being performed.

10. Lack of group differences for the first visit could be due to a variety of explanations. Generally, these reasons center around the tasks, strategies, subjects, and testing conditions of the study.

Implications for Further Research

On the basis of this investigation, the following suggestions are proposed for future studies concerning the use of self-directed and task-oriented strategies.

1. It is recommended that future researchers, examining the impact of self-directed and task-oriented strategies on performance, focus on the use of real world tasks that are modified for a laboratory setting. This is especially true when using volunteers as participants.

Conducting research within a controlled environment should significantly reduce exposure to visual and auditory distractors. Additionally, laboratory experiments greatly reduce many of the interactions between subjects and the experimenter. As has been stated previously, the vast majority of investigations conducted within a laboratory environment support the notion that strategy use of some type enhances task performance (Brown et al., 1985; Singer, Cauraugh, Murphey, et al., 1991).

2. Experimenters conducting research in real world settings should instruct and train all participants in the

use of self-directed and task-oriented strategies over the course of several sessions. This should allow individuals to gain not only the declarative knowledge with respect to strategies, but also the necessary procedural knowledge regarding the actual use of strategies within a task domain (Royer et al., 1993).

Many of the field investigations previously cited involved the training of individuals over a span of several weeks (Gray, 1990; Johnston-O'Connor & Kirschenbaum, 1986; Noel, 1980). Results supportive of the notion that strategies enhance skill execution in the real world are primarily observed when individuals have been directed in strategy use for an extended period of time. It would be interesting to repeat this same study in order to see if additional group differences occur in actual play situations, following several weeks of instruction in the use of self-monitoring and attentional focusing.

3. Volunteers do not appear to be the best type of participants for this kind of experiment. Therefore, it is proposed that this same experiment be conducted using dedicated racquetball players who are experiencing performance decrements due to stress or problems with attentional focus. Although the pool of subjects would be considerably smaller than that what was available for the present study, more meaningful results may ultimately be revealed if competitive players with serious attitudes serve

as subjects.

It would be interesting to determine if high-level racquetball players benefit differentially using self-monitoring, attentional focusing, or a combination of both in attempting to overcome obstructions to successful performances. Each strategy should benefit performance. However, additional research is needed to determine which of the strategies is more beneficial to achieving higher level performances.

4. Future research studies conducted in real world settings might also include competitive conditions and meaningful training situations. Basic skill tests do not appear to be as important to subjects as actual competition. This was observed in the present investigation as well as in the study of karate performance by Weinberg et al. (1981).

Perhaps this same type of study could be used to train a serious group of subjects for competition (e.g., in tennis or gymnastics camps). Athletes within the class could be divided so that an equal number received self-monitoring, attentional focusing, both strategies combined, or no strategy. It would be interesting to analyze group differences in performance when participants are executing skills meaningful to them or are performing against a rival.

To conclude, a better understanding of strategy use relative to skill level and type of task should be obtained once strategies are categorized into specific

classifications. Future research in the area of classification systems is important to coaches, sport psychologists, and athletes alike with respect to the information that may be gained. Further studies, using the self-directed and task-oriented classification system, may potentially provide knowledge indicating the most appropriate types of strategies that beginners and advanced performers should use for skill enhancement. Similarly, additional research should yield information regarding the appropriate types of strategies, depending upon the type of task to be executed (self-paced versus externally paced or short versus extended events), to incorporate into a learning setting. Classification systems will be beneficial to many individuals if the research findings indeed reveal definite trends regarding the best strategies to use for the performance situation at hand.

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APPENDIX A
INFORMED CONSENT FORM

University of Florida
Department of Exercise and Sport Sciences
Center for Exercise Science

Informed Consent

Project Title: The Effects of Self-Directed and Task-Oriented Cognitive Strategy Use for Achieving Racquetball Skills in Beginning and Advanced Players.

Principal Investigators: Robert N. Singer, Ph.D., L. Keith Tennant, Ph.D., Laurie M. Beach, MESS, Motor Behavior Laboratory, 25 Florida Gym, 392-0584.

This is to certify that I, _____, hereby agree to participate as a volunteer in this scientific investigation as part of an authorized research program at the University of Florida, under the supervision of Robert N. Singer, Ph.D. and L. Keith Tennant, Ph.D.

Purpose and Testing Procedures

Prior to testing, you will receive taped and written instructions about two racquetball skill tests (the diagonal lob serve and rally skill test), retention tests, and a modified play situation. Once these instructions are administered, you will proceed to the three-wall racquetball courts where you will perform 10 trial blocks of 15 diagonal lob serves, ten 30 s rallies, and a retention test for each of these skill tests. Approximately 1 week later, you will be asked to return to compete against three other players of a similar level of skill in a modified play situation.

General Information

- (a) I understand that the experimenter will answer any of my questions about the research project and my rights as a volunteer subject.
- (b) I understand that there is minimal risk to my health and well being.
- (c) I understand that I will not receive any compensation for my participation in this study.
- (d) I understand that I am free to withdraw my consent and to terminate my participation at any time.
- (e) I understand that my data and answers to any questions

will remain completely confidential. My identity will be withheld from data files, sheets, and analyses because a number coding system will be used. Only grouped data will be reported in any future publication.

- (f) I understand that if I am injured during the study, as a result of negligence of the principal investigator, the University of Florida, the Board of Regents of the State of Florida shall be liable only as provided by law. I understand that I may seek appropriate compensation for injury by contacting the insurance coordinator at 316 Stadium, University of Florida, (904-392-2556).

I have read and/or discussed the procedure described above and I understand. I have received a copy of this description and voluntarily agree to participate in this experiment.

Signature of Subject

Date

Subject No.

Signature of Witness

Date

The above named subject has been given a full explanation of the experiment:

Signature of Principal Investigator

Date

APPENDIX B
DEMOGRAPHIC DATA FORM

Directions: Please answer the following questions to the best of your knowledge.

Name _____ Subject No. _____

Address _____ Phone No. _____

1. How frequently do you play racquetball?

_____ 1-2 times/week _____ 5-6 times/week
_____ 3-4 times/week _____ Less than 1 time/week
_____ More than 6 times/week

2. Have you ever played three-wall racquetball?

_____ Yes _____ No

3. If yes, how many years have you played three-wall racquetball? _____ years.

4. Have you ever played four-wall racquetball?

_____ Yes _____ No

5. If yes, how many years have you played four-wall racquetball? _____ years

6. Have you ever played in a racquetball tournament?

_____ Yes _____ No

7. What is your level of play?

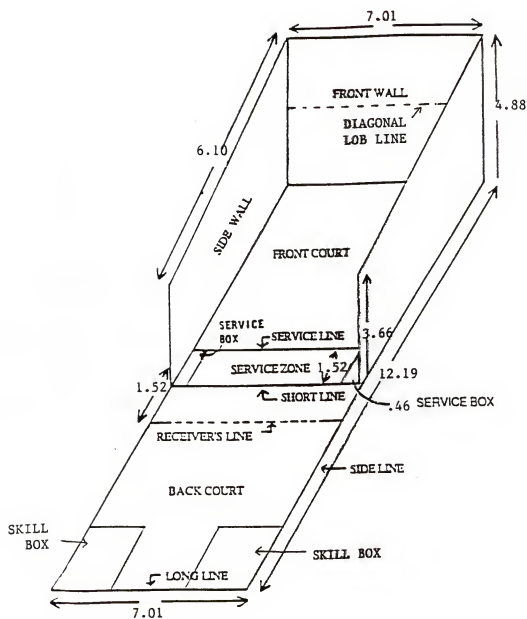
_____ Open, _____ A, _____ B, _____ C, _____ D

8. What is your age? _____ years

9. Are you right-handed or left-handed? _____

APPENDIX C
COURT MARKINGS AND MEASUREMENTS

MEASUREMENTS IN METERS



APPENDIX D
GENERAL INSTRUCTIONS FOR EXPERIMENTAL AND CONTROL GROUPS

Diagonal Lob Serve

The diagonal lob serve is a serve that hits high on the front wall (above the diagonal lob line), travels in a high arc, and lands with a high bounce in the opposite back corner of the court. For this skill, you will be asked to perform 10 trial blocks of 15 trials for a total of 150 trials. The experimenter will indicate which side of the court to begin the initial service. When serving to the right court, you will perform 5 trial blocks to the right followed by 5 trial blocks to the left. Just the reverse is true if your initial side is to the left court. Serves will earn points if they land within the skill test box or on the line defining the box.

When you arrive at the racquetball courts, a short practice will be allowed. You will have 1 practice trial to both the right and left sides of the court. Once you have completed the practice trials the experimenter will begin the skill test.

Rally Skill

The rally skill is used to determine a racquetball player's ability to keep the ball in play. You must initially position yourself behind the short line and may not completely cross this line during the testing period except to retrieve a ball. Begin by dropping the ball and hitting it to the front wall. The return ball may be struck in midair or after any number of bounces once it has hit the front wall. If the ball fails to return in the vicinity of the short line, you may move to the front of the court to retrieve the ball, but must return behind the short line to play the ball once again. If you completely miss the ball, the experimenter will provide you with another ball to put into play. Again, you must put the ball in play from behind the short line. For a hit to be considered legal, the ball must remain in bounds and hit the front wall before hitting the floor. All initial hits that are legal will be counted in the overall score.

You will perform 10 trial blocks of the rally skill test. Each rally (trial block) lasts for a period of 30 seconds.

Modified Play

For the modified play situation, you will play one match against three other players of a similar level of skill for a total of three matches. The experimenter will assign your opponent for each match. Each match consists of three 6-point games for an overall total of nine games.

The following instructions must be observed: (1) try to earn as many points as possible regardless of the game score since all points count toward your total. For example, if you are losing try to get as many points as possible in the game without giving in to your opponent, (2) when serving the ball, no two-wall serves will be allowed, and (3) each serve will result in 1 point given to the server or receiver. For example, the server may earn 1 point if their opponent hits the ball out of bounds or the return is not properly made by the opponent. However, the server's opponent may also earn 1 point if the server hits the ball out of bounds or the return is not properly made by the server. Each game should be played in accordance with all other rules for three-wall racquetball.

Once you are assigned an opponent, the experimenter will toss a coin to determine who will serve and receive. General rules for three-wall racquetball include: (1) when serving a ball, the serve must be made within the service zone, (2) two long balls in succession or the occurrence of one long ball and one short ball will put the server out,

(3) service balls must land beyond the short line, (4) a service ball that first lands outside either side line is a wide ball. One wide ball will put the server out, (5) a serve that fails to hit the front wall first will result in a loss of service, (6) if the receiver hits the ball causing it to strike the opponent, then the play will be replayed without points awarded, and (7) during rallies the ball must hit the front wall before hitting the floor and must be returned prior to bouncing twice on the floor.

After each game, the experimenter will record game points for both players. At the completion of all modified play, you will be asked to complete a performance scale.

APPENDIX E
BASIC PERFORMANCE STEPS FOR THE DIAGONAL LOB SERVE

Diagonal Lob Serve

The diagonal lob serve test is designed to measure your ability to serve and place the serve in a pre-designated area of the playing court. Several major points for enhancing your serving skill are described below:

Serving Position: Always assume the correct serving position prior to each service attempt. Stand in the opposite half of the service area and serve to the diagonal target area. Your position will determine the angle of the ball arc and whether the ball is traveling toward the appropriate target area. Standing closer to the sidewall will provide a wider angle of flight, whereas standing toward the court midline will reduce the angle.

Ball Bounce: When serving the underhand serve, the ball bounce should be such that the rebound is between 2-3 feet high. This can be accomplished by dropping the ball from about waist height.

Hitting the Ball: Hit the ball to the front wall and above the diagonal lob serve line located mid-way up the wall. This should be done using a slow underhand swing motion where ball contact is made as the racquet face begins the upswing portion of the serving stroke.

Hitting Force: Using excessive force on the serve is unnecessary as it will cause a loss of control. Easy to moderate force application is desirable. Whether the ball travels too far beyond the target or fails to make the target area, is a function of where the ball hits on the front wall. The higher the ball hits on the front wall, the further the ball will travel. The lower the ball hits on the front wall, a shorter distance will result.

Target Area: Observe whether the ball hits in the desired target. Make corrections for either the angle or the arc of the ball to enhance successive trials.

APPENDIX F
BASIC PERFORMANCE STEPS FOR THE RALLY SKILL TEST

Rally Skill

The rally skill test is designed to measure your general racquetball playing ability. Several major points for enhancing your racquetball skill performance are described below.

Ready Position: Always assume the ready position before each successive shot and again as quickly as possible after making a shot. In the ready position you are facing the front wall, slightly bent at the waist and knees, weight is slightly forward on the balls of your feet, the racquet is in front of your body in a ready position, and you should track the ball to anticipate your next shot.

Footwork: Be light on your feet and ready to move in any direction. Do not let the ball get close to your body. Position yourself so that a full swing may be taken.

Moving to the Ball: Anticipate where the ball will arrive and immediately go to that position. Position yourself for the best shot available as quickly as possible. Do not overrun the ball.

Racquet Swing: Hit the ball with a racquet swing that is parallel to the ground. Keep the racquet level when making a swing. Make sure that the racquet face is vertical

when contact is made with the ball. Try to hit the ball in the center of the racquet strings (sweet spot). After contact is made, remember to follow-through in the direction that you want the ball to travel.

Ball Control: Control the force of your swing so that it is compatible with your skill level. Increased hitting force will cause the ball speed to increase and potentially cause a loss of control. Hit the ball low on the front wall in a direction that will send the return ball back to you. Play the ball as fast as you can and still maintain reasonable control of the ball.

Actual Play: The rally is a simulation for actual play. During an actual play situation, the technique used in the rally is appropriate, but you would need to consider your opponent's position as well. Observe where your opponent is playing. If your opponent is toward the front of the court, you may wish to hit a lob. Likewise, if your opponent is in the back of the court, you may wish to hit a "dink". Attempt to hit passing shots or shots your opponent cannot easily return.

APPENDIX G
SELF-DIRECTED STRATEGY-USE SCALE FOR THE ACQUISITION
AND RETENTION TESTS

Directions: Please read each statement and indicate the number that best reflects your opinion. Respond as accurately as possible.

Answer questions 1 - 5 using the following scale for performance of the diagonal lob serve.

1 2 3 4 5 6 7 8 9 10

POOR

SUPERIOR

1. A correct serving position was maintained prior to each service attempt. _____
2. The ball was dropped from waist height. _____
3. The ball was struck using a slow underhand swing motion. _____
4. Contact with the ball was made as the racquet face began the upswing portion of the serving stroke. _____
5. Corrections were made for either the angle or arc of the ball to ensure the ball landed in the target area. _____

Answer questions 1 - 5 using the following scale for performance of the rally skill test.

1 2 3 4 5 6 7 8 9 10

POOR

SUPERIOR

1. The ready position was assumed after executing each shot. _____
2. Both my knees and waist were slightly bent and the racquet was positioned in front of my body when anticipating each shot. _____
3. I was positioned so that full swings could be executed with each shot. _____

4. When executing each swing, the racquet face was vertical upon contact with the ball. _____
5. Upon striking the ball with the racquet, the follow-through was in the desired direction. _____

APPENDIX H
TASK-ORIENTED STRATEGY-USE SCALE FOR THE ACQUISITION
AND RETENTION TESTS

Directions: Please read each statement and indicate the number that best reflects your opinion. Respond as accurately as possible.

Answer questions 1 - 6 using the following scale for performance of the diagonal lob serve.

1 2 3 4 5 6 7 8 9 10

NEVER

ALWAYS

1. Attention was directed to the rebound height of the ball once it was dropped for the serve. _____
2. Attention was allocated to the diagonal lob serve line on the front wall. _____
3. An easy to moderate hitting force was used when serving the ball. _____
4. Attention was focused on the angle at which the ball was served. _____
5. Attention was maintained on the arc the ball traveled in mid-air. _____
6. Attention was directed to the target area. _____

Answer questions 1 - 5 using the following scale for performance of the rally skill test.

1 2 3 4 5 6 7 8 9 10

NEVER

ALWAYS

1. In order to anticipate each shot, I visually tracked the path of the ball. _____
2. Attention was maintained on the direction the ball was traveling. _____
3. Attention was allocated to the speed of the ball. _____

4. Contact with the ball was made in the center of the racquet (sweet spot). _____
5. The ball was struck with a reasonable amount of force to control the ball. _____

APPENDIX I
COMBINED SELF-DIRECTED AND TASK-ORIENTED STRATEGY-USE SCALE
FOR THE ACQUISITION AND RETENTION TESTS

Directions: Please read each statement and indicate the number that best reflects your opinion. Respond as accurately as possible.

Answer questions 1 - 3 using the following scale for performance of the diagonal lob serve.

1 2 3 4 5 6 7 8 9 10

POOR

SUPERIOR

1. A correct serving position was maintained prior to each service attempt. _____
2. The ball was struck using a slow underhand swing motion. _____
3. Corrections were made for either the angle or arc of the ball to ensure the ball landed in the target area. _____

Answer questions 4 - 6 using the following scale for performance of the diagonal lob serve.

1 2 3 4 5 6 7 8 9 10

NEVER

ALWAYS

4. Attention was allocated to the diagonal lob serve line on the front wall. _____
5. An easy to moderate hitting force was used when serving the ball. _____
6. Attention was maintained on the arc the ball traveled in mid-air. _____

Answer questions 1 - 3 using the following scale for performance of the rally skill test.

1 2 3 4 5 6 7 8 9 10

POOR

SUPERIOR

1. The ready position was assumed after executing each shot. _____
2. Both my knees and waist were slightly bent and the racquet was positioned in front of my body when anticipating each shot. _____
3. Upon striking the ball with the racquet, the follow-through was in the desired direction. _____

Answer questions 4 - 6 using the following scale for performance of the rally skill test.

1 2 3 4 5 6 7 8 9 10

NEVER

ALWAYS

4. In order to anticipate each shot, I visually tracked the path of the ball. _____
5. Attention was maintained on the direction the ball was traveling. _____
6. Contact with the ball was made in the center of the racquet (sweet spot). _____

APPENDIX J
SELF-DIRECTED STRATEGY-USE SCALE
FOR THE MODIFIED PLAY SITUATION

Directions: Please read each statement and indicate the number that best reflects your opinion. Respond as accurately as possible.

1 2 3 4 5 6 7 8 9 10

POOR

SUPERIOR

1. Correct serving positions were assumed prior to each service attempt. _____
2. Corrections were made for either the angle or arc of the ball to ensure the ball landed in the target area. _____
3. The ready position was assumed after executing each shot during play. _____
4. I was positioned so that full swings could be executed with each shot. _____
5. Upon striking the ball with the racquet, the follow-through was in the desired direction. _____

APPENDIX K
TASK-ORIENTED STRATEGY-USE SCALE
FOR THE MODIFIED PLAY SITUATION

Directions: Please read each statement and indicate the number that best reflects your opinion. Respond as accurately as possible.

1 2 3 4 5 6 7 8 9 10

NEVER

ALWAYS

1. Attention was focused on the angle at which the ball was served. _____
2. Attention was directed to the target area. _____
3. The ball was struck with the appropriate amount of force when executing serves. _____
4. Attention was maintained on the direction the ball was traveling when playing. _____
5. Attention was allocated to the speed of the ball when playing. _____
6. The ball was struck with a reasonable amount of force to control the ball while playing. _____

APPENDIX L
COMBINED SELF-DIRECTED AND TASK-ORIENTED
STRATEGY-USE SCALE FOR THE MODIFIED PLAY SITUATION

Directions: Please read each statement and indicate the number that best reflects your opinion. Respond as accurately as possible.

Answer questions 1 - 3 using the following scale.

1 2 3 4 5 6 7 8 9 10

POOR

SUPERIOR

1. Correct serving positions were assumed prior to each service attempt. _____
2. Corrections were made for either the angle or arc of the ball to ensure the ball landed in the target area. _____
3. The ready position was assumed after executing each shot during play. _____

Answer questions 4 - 6 using the following scale.

1 2 3 4 5 6 7 8 9 10

NEVER

ALWAYS

4. Attention was focused on the angle at which the ball was served. _____
5. Attention was maintained on the direction the ball was traveling when playing. _____
6. The ball was struck with a reasonable amount of force to control the ball while playing. _____

APPENDIX M
GENERAL RACQUETBALL SCALE FOR CONTROL GROUPS

Directions: Please read each statement and indicate the number that best reflects your opinion. Respond as accurately as possible using the following scale.

1 2 3 4 5 6 7 8 9 10

NEVER

ALWAYS

Diagonal Lob Serve/Modified Play

1. When serving the ball, I generally considered my performance to be satisfactory. _____
2. When serving the ball, I tried to 'do my best'. _____
3. The ball hit in the target area an adequate number of times when executing serves. _____
4. Adjustments in serving techniques were rarely necessary. _____
5. Overall, I performed to the best of my ability. _____

Rally Skill Test/Modified Play

6. When the ball was in play, I generally considered my performance to be satisfactory. _____
7. When playing the ball, I tried to 'do my best'. _____
8. I was in control of the ball when the ball was in play. _____
9. Adjustments in playing techniques were rarely necessary. _____
10. Overall, I performed to the best of my ability. _____

APPENDIX N
SELF-DIRECTED STRATEGY TREATMENT TAPE

The purpose of this tape is to explain a cognitive strategy which may enhance your performance on a variety of movement tasks or in sports. This strategy is called self-monitoring. It may be useful in sports such as badminton, racquetball, golf, or bowling. You will be allowed to practice this strategy prior to starting the experiment.

SELF-MONITORING. The purpose of self-monitoring is to provide you with information about how well you perform (for example, your successes) and also to increase your self-awareness for mistakes or performance error. Awareness of a successful performance may enhance your level of self-confidence, thus motivating you to be more effective in performing a particular task. If a person believes that they have the ability to successfully perform a skill, then the likelihood of doing so is greater. Self-monitoring also involves developing an awareness of your mistakes or performance error. It is a process that provides individuals with feedback and the appropriate corrections to be made. Not only is an awareness of mistakes important for learning, but how individuals deal with their mistakes is crucial for effective learning and skill improvement to occur.

The manner in which you self-monitor is important since it may impact skill improvement. If you tend to focus on performance error as negative, then you may experience a decrease in both motivation to continue and in your overall performance level. Likewise, if you attend only to what you have successfully performed, then you will be less likely to raise your level of skill. Therefore, the key for the self-monitoring process to work is to: (1) be aware of your successes and what is performed well, and (2) attend to your mistakes in a positive and constructive manner. Maintaining positive, constructive thoughts is crucial for performance to improve. Avoid negative thoughts as they may undermine or weaken your overall performance and reduce your motivation to continue.

As an example, self-monitoring may be used while performing a tennis serve. Once the serve is executed, the performer may review whether: (a) the entire body was positioned correctly, (b) the correct stance was made, (c) an appropriate grip was used, (d) a good ball toss was made, and (e) the racquet was positioned properly prior to contact with the ball. While self-monitoring, the performer pays attention to those aspects that were performed well and to those aspects that were executed incorrectly. Upon conclusion of the self-monitoring process, the performer should attempt to execute the serve again using information from the prior performance to improve future attempts.

Once performance error is significantly reduced, attempt to set specific, attainable goals for yourself and continue to use the self-monitoring process as an aid in reaching these goals. Self-monitoring, if used effectively, should increase your chances of succeeding and improving your overall performance.

Now you will be provided with a guided practice session using the self-monitoring technique. In front of you is a small container and small bean bags. Your goal is to toss the bean bags into the container using an underhand toss. Be sure to attend to both your successful and unsuccessful trials. If you should miss the container, try and determine if performance may be improved by modifying such aspects as the location or position of your body, as well as the angle or height of your toss. Now you may begin your practice.

Stop practicing. The experiment that you are going to participate in involves the performance of racquetball skills. When performing a serve or rally, attempt to self-monitor the actions involved in the execution of these skills. Focus your attention on those aspects which are performed without error and attend to mistakes in a constructive manner. During the experiment, the investigator will provide you with basic performance steps and questionnaires which will help you in the self-monitoring process.

At this time, the experimenter will provide you with a short quiz to test your comprehension of this material. Please answer each question to the best of your ability.

APPENDIX O
TASK-ORIENTED STRATEGY TREATMENT TAPE

The purpose of this tape is to explain a cognitive strategy which should enhance your performance on a variety of movement tasks and in sports. This strategy is called attentional focusing. It may be used in sports such as badminton, racquetball, golf, or bowling. You will be allowed to practice using this strategy prior to starting the experiment.

ATTENTIONAL FOCUSING. Attentional focusing requires that you intensely focus your attention on one relevant feature of the task being performed. For example, to properly focus your attention in the sport of volleyball, you may choose to concentrate on both the ball and the location of the target where you will serve the ball. Focusing helps you to block out visual and auditory distractors as well as distracting thoughts which could hinder your performance.

An important part of maintaining attention is having the ability to concentrate on the desired task without being distracted by outside influences. You can improve this ability to concentrate by focusing on a specific aspect of the task being performed. To do this, determine the most important cue for successful completion of the desired task

and then focus your attention on this component. In an example using volleyball, focusing would be completed by initially directing your attention to the target location and then to the ball for the serve. You would focus your attention on both the target and then the ball and try to feel "connected" with the target and ball.

Put aside this paper to begin practice. Take a few moments and mentally practice focusing on a volleyball serve. Remember, concentrate first on the target and then on the ball, try to feel connected to the ball, and visualize yourself making contact with the ball. Now close your eyes and begin. STOP and open your eyes. Once again, close your eyes and focus on the performance of a volleyball serve. See yourself executing a serve. Concentrate on both the target and ball and try to feel connected to the ball as you make contact. STOP and open your eyes. A guided practice session will be provided at this point to help you rehearse this technique. In front of you is a volleyball. I would like you to practice focusing on the ball and follow my directions. Ready, let's begin. Look at the ball, focus all of your attention on the ball, and try to feel connected with the ball. Continue to focus on the ball until directed to stop. STOP. Stop focusing and now close your eyes until instructed to open them. Open your eyes and repeat the same process. Look at the ball, focus all of your attention on the ball, and try to feel connected with the ball. Continue

to focus on the ball until directed to stop. STOP. Stop focusing and now close your eyes until instructed to open them. Open your eyes.

During actual play in a sport such as volleyball, focusing may also be executed by determining the position of both your opponents and teammates and by attending to cues provided by the movements of your opponents that will allow you to anticipate the speed, direction, and arc of the ball upon return. In an actual play situation, you will need to determine what to focus your attention on and when to focus. At this point, put aside this paper once again and close your eyes. Take a few moments and mentally practice focusing your attention on a volleyball in play. Focus on the speed, direction, and arc of the ball as it travels toward you. Attend to the location of your opponents and teammates for the return. STOP. Once again, attend to the speed, direction, and arc of the ball as it travels toward you. Determine the positions of your teammates and opponents for the return. STOP and open your eyes. Remember these steps for mentally and physically focusing on a target. They should be practiced before each performance.

The experiment that you are going to participate in involves the performance of racquetball skills. When performing a serve or rally, attempt to focus your attention on relevant aspects of the task. Concentrate on the task and attempt to block visual and auditory distractors as well as distracting thoughts. The experimenter will provide you

with basic performance steps and questionnaires which will help you with the process of focusing.

At this time, the experimenter will provide you with a short quiz to test your comprehension of this material.

Please answer each question to the best of your ability.

APPENDIX P
COMBINED SELF-DIRECTED AND TASK-ORIENTED
STRATEGY TREATMENT TAPE

The purpose of this tape is to explain a cognitive strategy which may enhance your performance on a variety of movement tasks or in sports. This strategy has two parts, self-monitoring and attentional focusing. It may be useful in sports such as badminton, racquetball, golf, or bowling. You will be allowed to practice each part prior to starting the experiment.

SELF-MONITORING. The purpose of self-monitoring is to provide you with information about how well you perform (for example, your successes) and also to increase your self-awareness for mistakes or performance error. Awareness of a successful performance may enhance your level of self-confidence, thus motivating you to be more effective in performing a particular task. If a person believes that they have the ability to successfully perform a skill, then the likelihood of doing so is greater. Self-monitoring also involves developing an awareness of your mistakes or performance error. It is a process that provides individuals with feedback and the appropriate corrections to be made. Not only is an awareness of mistakes important for learning, but how individuals deal with their mistakes is

crucial for effective learning and skill improvement to occur.

The manner in which you self-monitor is important since it may impact skill improvement. If you tend to focus on performance error as negative, then you may experience a decrease in both motivation to continue and in your overall performance level. Likewise, if you attend only to what you have successfully performed, then you will be less likely to raise your level of skill. Therefore, the key for the self-monitoring process to work is to: (1) be aware of your successes and what is performed well, and (2) attend to your mistakes in a positive and constructive manner. Maintaining positive, constructive thoughts is crucial for performance to improve. Avoid negative thoughts as they may undermine or weaken your overall performance and reduce your motivation to continue.

As an example, self-monitoring may be used while performing a tennis serve. Once the serve is executed, the performer may review whether: (a) the entire body was positioned correctly, (b) the correct stance was made, (c) an appropriate grip was used, (d) a good ball toss was made, and (e) the racquet was positioned properly prior to contact with the ball. While self-monitoring, the performer pays attention to those aspects that were performed well and to those aspects that were executed incorrectly. Upon conclusion of the self-monitoring process, the performer

should attempt to execute the serve again using information from the prior performance to improve future attempts.

Once performance error is significantly reduced, attempt to set specific, attainable goals for yourself and continue to use the self-monitoring process as an aid in reaching these goals. Self-monitoring, if used effectively, should increase your chances of succeeding and improving your overall performance.

Now you will be provided with a guided practice session using the self-monitoring technique. In front of you is a small container and small bean bags. Your goal is to toss the bean bags into the container using an underhand toss. Be sure to attend to both your successful and unsuccessful trials. If you should miss the container, try and determine if performance may be improved by modifying such aspects as the location or position of your body, as well as the angle or height of your toss. Now you may begin your practice.

Stop practicing. Presently, the experimenter will provide you with a short quiz to test your comprehension of this material. Please answer questions 1 - 5 to the best of your ability.

ATTENTIONAL FOCUSING. The second part of this strategy is attentional focusing. Attentional focusing requires that you intensely focus your attention on one relevant feature of the task being performed. For example, to properly focus your attention in the sport of volleyball, you may choose to

concentrate on both the ball and the location of the target where you will serve the ball. Focusing helps you to block out visual and auditory distractors as well as distracting thoughts which could hinder your performance.

An important part of maintaining attention is having the ability to concentrate on the desired task without being distracted by outside influences. You can improve this ability to concentrate by focusing on a specific aspect of the task being performed. To do this, determine the most important cue for successful completion of the desired task and then focus your attention on this component. In an example using volleyball, focusing would be completed by initially directing your attention to the target location and then to the ball for the serve. You would focus your attention on both the target and then the ball and try to feel "connected" with the target and ball.

Put aside this paper to begin practice. Take a few moments and mentally practice focusing on a volleyball serve. Remember, concentrate first on the target and then on the ball, try to feel connected to the ball, and visualize yourself making contact with the ball. Now close your eyes and begin. STOP and open your eyes. A guided practice session will be provided at this point to help you rehearse this technique. In front of you is a volleyball. I would like you to practice focusing on the ball and follow my directions. Ready, let's begin. Look at the ball, focus

all of your attention on the ball, and try to feel connected with the ball. Continue to focus on the ball until directed to stop. STOP. Stop focusing and now close your eyes until instructed to open them. Open your eyes.

During actual play in a sport such as volleyball, focusing may also be executed by determining the position of both your opponents and teammates and by attending to cues provided by the movements of your opponents that will allow you to anticipate the speed, direction, and arc of the ball upon return. In an actual play situation, you will need to determine what to focus your attention on and when to focus. At this point, put aside this paper once again and close your eyes. Take a few moments and mentally practice focusing your attention on a volleyball in play. Focus on the speed, direction, and arc of the ball as it travels toward you. Attend to the location of your opponents and teammates for the return. STOP and open your eyes. Remember these steps for mentally and physically focusing on a target. They should be practiced before each performance.

The experiment that you are going to participate in involves the performance of racquetball skills. When performing a serve or rally, attempt to self-monitor the actions involved in the execution of these skills. Focus your attention on those aspects which are performed without error and attend to mistakes in a constructive manner. Additionally, attend to relevant aspects of the task to

block visual and auditory distractors as well as distracting thoughts. The experimenter will provide you with basic performance steps and questionnaires which will help you with the process of self-monitoring and focusing. At this point, the experimenter will provide you with a short quiz to test your comprehension of this material. Please answer questions 6 - 11 to the best of your ability.

APPENDIX Q
GENERAL INFORMATION ABOUT RACQUETBALL FOR CONTROL GROUPS

The purpose of this tape is to briefly present the sport of racquetball. This discussion will include a brief introduction to the history of the game, a description of the three-wall racquetball courts, and a short discussion of the equipment and basic movements used in the sport.

The development of racquetball occurred primarily in the United States from the sport of paddleball. Earl Risky, a member of the Department of Physical Education at the University of Michigan, developed the sport of paddleball upon observing tennis players training at the handball courts. In 1949, Joe Sobek developed both stringed racquets to replace the wooden paddles in paddleball as well as improved balls for faster games. Between 1949 and 1959, the new sport caught on quickly throughout the country; however, it was not until 1969 that the name 'racquetball' was officially applied to the sport and the International Racquetball Association was developed. Racquetball became a very popular sport throughout the 1970s and 1980s. It was in 1979 that the International Racquetball Association was renamed the American Amateur Racquetball Association. A primary purpose of this association is to conduct regional, state, and national racquetball championship tournaments.

Racquetball is a sport which may be played in an indoor area enclosed by four walls, a floor, and a ceiling or it may be played outdoors on one and three-wall courts. The basic three-wall racquetball court consists of a front wall, two side walls, a front and back court, a service line, two service boxes, a service zone, a short line, a receiving line, two side lines, and a long line.

The front court is the area of play located between the service line and the front wall. The back court is the area of play located between the receiving line and the long line. The service line and short line define the service zone from which a server must serve the ball. Service boxes, which are located on both sides of the service zone, are used when playing doubles. Non-serving partners must remain in the service box until the ball crosses the short line. The receiving line is the dotted line located 5 feet behind the short line. An opponent may cross the receiving line once the ball has been served. The side lines and long line mark the boundaries of the three-wall racquetball court.

The basic equipment used in racquetball include a racquet, racquetball, and eyeguards. Racquets come in small, medium, and large face sizes. Racquet frames may be constructed of plastic, aluminum, or graphite. According to sources, graphite racquets provide the racquetball player with greater accuracy and power. Racquet strings, which

meet the standards of the American Amateur Racquetball Association, may be made of gut, nylon, plastic, metal, or a combination of these materials. Regulation racquets should include a thong which may be securely fastened to the player's wrist. The typical ball used in racquetball should be 2.25 inches in diameter and weigh about 1.4 ounces. Racquetballs come in a variety of colors; however, the typical color seen in many tournaments is blue. Eyeguards should be worn by racquetball players to avoid permanent eye damage which may result from a possible injury. Protective eyewear is required in most tournaments and may be required by officials in certain racquetball court facilities.

When playing three-wall racquetball, players may use either the "Eastern" forehand grip (also referred to as the handshake grip) or the all purpose grip which is a compromise between both a backhand and forehand grip. The all purpose grip is recommended for novices as it allows for more effective backhand strokes to be executed.

The game of racquetball consists of forehand strokes, backhand strokes, and a variety of shots and serves. For this experiment, you will be asked to perform diagonal lob serves, execute rallies, and participate in a modified play situation. You should perform to the best of your ability for all tests. In the modified play situation, you will be asked to return to the courts and play singles against three other opponents of a similar level of skill. It is strongly

recommended that each player wear eyeguards during all modified play to prevent potential injuries. At this point, the experimenter will provide you with a short quiz to test your understanding of the material just provided. Once this quiz is completed, you and the experimenter will proceed to the three-wall racquetball courts to complete the first part of the study.

APPENDIX R
QUIZ ON SELF-DIRECTED STRATEGY TREATMENT

Directions: Circle "T" if the statement is true or "F" if the statement is false.

- | | | |
|---|---|--|
| T | F | 1. The self-monitoring process consists of attending to both performance successes and mistakes. |
| T | F | 2. Self-monitoring can enhance your level of self-confidence and level of motivation to perform. |
| T | F | 3. Attending to performance error in a non-constructive, negative way may weaken performance. |
| T | F | 4. Once performance error is reduced, you should set specific attainable goals and continue to use self-monitoring to reach those goals. |
| T | F | 5. Learning from mistakes is not important in terms of improving skill level. |

APPENDIX S
QUIZ ON TASK-ORIENTED STRATEGY TREATMENT

Directions: Circle "T" if the statement is true or "F" if the statement is false.

- | | | | |
|---|---|----|---|
| T | F | 1. | To maintain your attention, try to intensely focus on one relevant feature of the skill you are performing. |
| T | F | 2. | Focusing should help you to block out distracting thoughts that could impair performance. |
| T | F | 3. | To successfully focus, direct your attention to the target of interest and try to feel connected to that target. |
| T | F | 4. | Focusing should help you block out auditory and visual distractions. |
| T | F | 5. | In actual play situations, attention may be focused on the position of both opponent(s) and teammate(s) and on such factors as speed and direction. |
| T | F | 6. | Focusing on a task is disruptive to maintaining attention and could result in a poor performance. |

APPENDIX T
QUIZ ON COMBINED SELF-DIRECTED AND TASK-ORIENTED
STRATEGY TREATMENT

Directions: Circle "T" if the statement is true or "F" if the statement is false.

- | | | |
|---|---|--|
| T | F | 1. The self-monitoring process consists of attending to both performance successes and mistakes. |
| T | F | 2. Self-monitoring can enhance your level of self-confidence and level of motivation to perform. |
| T | F | 3. Attending to performance error in a non-constructive, negative way may weaken performance. |
| T | F | 4. Once performance error is reduced, you should set specific attainable goals and continue to use self-monitoring to reach those goals. |
| T | F | 5. Learning from mistakes is not important in terms of improving skill level. |
-
- | | | |
|---|---|---|
| T | F | 6. To maintain your attention, try to intensely focus on one relevant feature of the skill you are performing. |
| T | F | 7. Focusing should help you to block out distracting thoughts that could impair performance. |
| T | F | 8. To successfully focus, direct your attention to the target of interest and try to feel connected to that target. |
| T | F | 9. Focusing should help you block out auditory and visual distractions. |
| T | F | 10. In actual play situations, attention may be focused on the position of both opponent(s) |

and teammate(s) and on such factors as speed and direction.

- T F 11. Focusing on a task is disruptive to maintaining attention and could result in a poor performance.

APPENDIX U
QUIZ ON THE GENERAL INFORMATION OF RACQUETBALL

Directions: Circle "T" if the statement is true or "F" if the statement is false.

- | | | | |
|---|---|----|--|
| T | F | 1. | The service line and short line define the service zone from which a server must serve the ball. |
| T | F | 2. | The side lines and long line mark the boundaries of the three-wall racquetball court. |
| T | F | 3. | Regulation racquets should include a thong which may be securely fastened to the player's wrist. |
| T | F | 4. | A typical color for a racquetball is blue. |
| T | F | 5. | Novices are recommended to use the all purpose grip to execute effective backhand strokes. |
| T | F | 6. | Most tournament officials do not require players to use eyeguards. |

APPENDIX V
ORIGINAL APPROVAL BY THE UNIVERSITY OF FLORIDA
INSTITUTIONAL REVIEW BOARD

UNIVERSITY OF FLORIDA
INSTITUTIONAL REVIEW BOARD
114 PSYCHOLOGY BUILDING
GAINESVILLE, FL 32611-2065
(904) - 392 - 0433

October 18, 1993

TO: Ms. Laurie M. Beach
305 FLG

FROM: C. Michael Levy, Chair, 
University of Florida Institutional
Review Board

SUBJECT: Approval of Project # 93.393
The effects of self-directed & task-oriented cognitive strategy use
on achieving racquetball skills for beginning & advanced players

I am pleased to advise you that the University of Florida Institutional Review Board has recommended the approval of this project. The Board concluded that your subjects will not be placed at risk in this research. Given your protocol it is essential that you obtain written informed consent from each participant.

If you wish to make any changes in this protocol, you must disclose your plans before you implement them so that the Board can assess their impact on your project. In addition, you must report to the Board any unexpected complications arising from the project which affect your subjects.

If you have not completed this project by October 18, 1994, please telephone our office (392-0433) and we will tell you how to obtain a renewal.

By a copy of this memorandum, your Chair is reminded of the importance of being fully informed about the status of all projects involving human subjects in your department, and for reviewing these projects as often as necessary to insure that each project is being conducted in the manner approved by this memorandum.

CML/h2

cc: Vice President for Research
College Dean

Unfunded

Drs. R. Singer & L. K. Tennant

APPENDIX W
NARRATION FOR THE RACQUETBALL SKILL TESTS VIDEOTAPE

Initial 3-Wall View

1. These are the three-wall racquetball courts where you will be tested for this study.
2. Notice the diagonal lob serve line on the front wall, the service zone area, the short line which is important in the rally skill test, and the two back skill boxes with point value lines ranging from 1 to 7. The higher the point value the better the score when making diagonal lob serves.

Diagonal Lob Serve Skill Test

1. Notice that the player stands to the right in the service zone when making underhand serves to the back left side and stands to the left in the service zone when serving to the back right side.
2. The serve must hit the front wall above the diagonal lob serve line and must make a slow, high arc in the air before landing in the designated skill box.
3. The closer to the long line the ball hits within the back skill boxes, the better the score.

Rally Skill Test

1. Notice that the player never crosses the short line when rallying the ball except to retrieve the ball.
2. Also notice that the player is rallying the ball as fast as possible without losing control of the ball.
3. Finally, notice that the ball may be struck in midair, after it strikes the ground and after any number of bounces.

APPENDIX X
QUESTIONNAIRE ON THE USE OF STRATEGIES BY
CONTROL GROUPS

Directions: Answer each question completely and to the best of your knowledge.

1. Did you use or develop any type of strategy or skill technique that was beneficial while participating in this study? _____ YES _____ NO
2. If you answered "yes" to Question 1, indicate at the bottom of this page the type(s) of strategy(s) or technique(s) used.
3. Do you feel that these strategies or techniques you used helped to improve your performance?
_____ YES _____ NO
4. To the best of your ability estimate the total percentage of time these strategies were used. _____%
5. If more than one strategy was used, indicate the strategy that you feel was most beneficial to your performance.
6. To the best of your ability, indicate the total percentage of time devoted to using the most beneficial strategy indicated in Question 5. _____%

BIOGRAPHICAL SKETCH

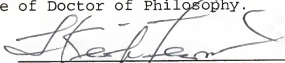
Laurie M. Beach was born on February 18, 1958 in Gainesville, FL. She attended the University of Florida and was awarded a Bachelor of Arts degree in the field of anthropology in 1981 and a Master Exercise and Sport Sciences specializing in wellness in 1988. After a short leave from school, Laurie returned to the University of Florida in 1990 to pursue a doctorate from the College of Health and Human Performance specializing in motor behavior. She completed her dissertation and was awarded a Ph.D. in December 1994.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



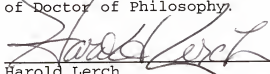
Robert N. Singer, Chair
Professor of Exercise and
Sport Sciences

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



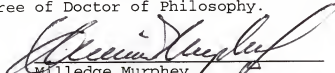
L. Keith Tennant, Cochair
Associate Professor of
Exercise and Sport Sciences

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



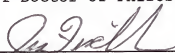
Harold Lerch
Professor of Exercise and
Sport Sciences

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



Milledge Murphey
Associate Professor of
Exercise and Sport Sciences

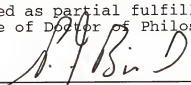
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.



Fra Fischler
Professor of Psychology

This dissertation was submitted to the Graduate Faculty of the College of Health and Human Performance and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December, 1994



Dean, College of Health and
Human Performance

Dean, Graduate School